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# USSR Report

TRANSPORTATION

No. 135

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## CIVIL AVIATION

### MINISTRY COLLEGIUM REVIEWS 'STRELA' ATC SYSTEM STATUS, OTHER PROBLEMS

Moscow VOZDUSHNYY TRANSPORT in Russian 27 Aug 83 p 2

[Unattributed report: "In the Ministry of Civil Aviation Collegium"]

[Text] At its regular meeting, the collegium of the Ministry of Civil Aviation considered the question of preparing the Soviet "Strela" automated air traffic control system for commissioning in the Rostov zone. A report was heard from V. Zamyatin, chief of the North Caucasus Administration of Civil Aviation. It was noted during the course of the discussions that despite fulfillment of the plan for 1982 and the first half of this year for capital and construction and assembly work, the preparation of a number of projects for testing is being delayed.

One of the main reasons for this situation is shortcomings in the work of some civil aviation administrations and a number of ministries and administrations, namely the North Caucasus Administration and the Construction Board for the "Strela" automated ATC system. The premises have still not been made ready for setting up technological equipment for the system, and questions of delivering general industrial equipment, sets of articles and cable products have not been fully resolved. Schedules for the commissioning of the refrigerator shop and the technical building at the center are being disrupted, and this, in turn, has resulted in delay in setting up the computer facilities. The slow rates of housing construction are affecting staffing at the center.

The Ministry of Civil Aviation collegium adopted a resolution setting out concrete measures to liquidate the lagging that has been permitted and to complete all construction and assembly work and startup work in good time and to a good standard, and to conduct the first stage of state testing of the system in 1983.

The collegium meeting discussed the question of enhancing the role of sector scientific research organizations in work to conserve and make rational use of raw materials, fuel and energy and other material resources in civil aviation in light of the requirements of the CPSU Central Committee November (1982) and June (1983) plenums.

In his report, P. Zhil'tsov, chief of the Ministry of Civil Aviation Main Scientific and Technical Administration, noted that in the field of solving

this important problem in civil aviation, purposeful work is being done to further improve methods in flying and technical operations, standardize the consumption of aviation fuel, improve the structure of the air space and the organization of air traffic control, improve airport services, reduce test-bench and flight testing for aircraft following repairs, optimize the airline network, and develop and set up sector automated management systems.

As a result of the realization of a sector program to conserve aviation fuel on the basis of introducing scientific and technical developments and the conducting of systematic work in the administrations of civil aviation, in 1982 a reduction in the consumption of aviation fuel was achieved. Thanks to the implementation of measures worked out by the institutes and aviation enterprises, during the period 1980-1982, some 110.5 million kilowatt-hours of electricity were saved, together with more than 31,000 tons of coal, more than 10,000 tons of fuel oil, and more than 60 million cubic meters of gas.

Together with the organizations of the Ministry of the Aviation Industry, the scientific research organizations in the sector are doing systematic work in the field of developing and introducing economic aviation equipment and new and more economical aero engines, increasing design service life and the periods between maintenance, working out progressive methods to rebuild components and protect power units from corrosion, developing a normative base for material-technical support, working on more economical projects for airports and ground installations and protective coatings for runways, and developing sector automated management systems.

In a resolution adopted on this question it was noted that the growing requirements for saving material and fuel and energy resources require further activation of work by sector scientific research organizations, and also by the managers of civil aviation organizations and enterprises in this field. Sector scientists are still doing only poor work jointly with the organizations of the Ministry of the Aviation Industry to improve the stability of the characteristics of aero engines now being operated, and on washdown for the gas and airflow passages in engines; and the schedules for the introduction of polyurethane coatings are being delayed, and the modernization of aircraft already in operation, in order to improve their economical operation, is not being carried out.

As head institute, the State Scientific Research Institute for Civil Aviation is still performing insufficiently purposeful work with industry in order to improve the fuel efficiency of aircraft now in operation or under development. Recommendations drawn up by the institutes to conserve aviation fuel are being poorly implemented, and as a result many flights do not take place at optimum speeds or altitudes, with large fuel residues, and the recommendations on towing are being violated. At the same time, the scientific research organizations of civil aviation do not have the proper inventor's control over the introduction of the results of scientific research work and compliance with recommendations and management documents on problems of saving material and fuel and energy resources. Substantiated standards for consumption and recommendations on standard consumption are still lacking for many kinds of aviation fuels and lubricants.

The Ministry of Civil Aviation collegium meeting examined the course of the All-Union "Aviavneshtekhpustavka" association's fulfillment of its functions as general supplier in technical cooperation with foreign countries in the construction of air transportation projects; and a number of other production matters were discussed.

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## CIVIL AVIATION

### COLLEGIUM EXAMINES POOR CONDITIONS AT AVIATION PLANTS

Moscow VOZDUSHNYY TRANSPORT in Russian 10 Sep 83 p 1

[Unattributed report: "In the Ministry of Civil Aviation Collegium and the Presidium of the Aviation Workers' Trade Union Central Committee"]

[Text] The collegium of the Ministry of Civil Aviation has examined the question of violations of technological, financial and planning discipline and instances of distortions in state accountability at civil aviation plants, along with measures to eliminate them. It was noted that checks conducted by the USSR People's Control Committee, Ministry of Civil Aviation commissions and the "Aviaremонт" all-union production association have revealed violations at a number of civil aviation aircraft-repair plants. Thus, for the first half of 1983, the No 31 plant (director S. Krechet) reported 100.7-percent plan fulfillment for sold output. In reality, the target was not met and clients failed to receive the planned quantity of finished output. Cases of violations of state discipline have been permitted at the enterprise previously, but the plant management has failed to take steps to bring things into proper order.

Writeups in state accountability reports have also been revealed at No 400 and No 403 plants (directors V. Sladkov and P. Volokitin). Violations of bookkeeping accounts have occurred at civil aviation plants No 402 and No 21, where I. Volkov and B. Dmitriyev are in charge. These violations have been the result of poor organizational work and a loss of any sense of responsibility on the part of the plants' management personnel for quality fulfillment of the plan and for the thrifty use and storage of material values. What has occurred indicates that in these collectives today's requirements for executive and personal discipline are not being observed.

The Ministry of Civil Aviation collegium adopted a resolution on this matter. The management of the "Aviaremонт" all-union production association and the directors of civil aviation plants have been obliged to take immediate steps to bring order to the organization of production and strengthen state and labor discipline in accordance with the decisions of the CPSU Central Committee November (1982) and June (1983) plenums, and also the appropriate Ministry of Civil Aviation orders,

It is essential to enhance the personal responsibility of management personnel at civil aviation plants and the plants of the "Aviaremонт" association for

the timely and good quality fulfillment of the plan in terms of all indicators, and for the authenticity of accounting figures, observance of the regime of economy and insuring good quality repair work.

Work must be done at civil aviation plants to insure the effective action of the Law on Labor Collectives, recruiting workers and employees into production management, and improving public control over production and economic activities.

A report on the second question considered was presented by G. Vasil'yev, chief of the Ministry of Civil Aviation Audit Department, on the status of and measures to further improve auditing work in civil aviation. The collegium noted that within the sector active work is being done, aimed at a qualitative improvement in administrative control. As a result of the steps taken, the personal responsibility of managers and officials for the level of state, financial, production and labor discipline has been enhanced.

More attention has been given to the extensive publicizing of auditing results, and this, in turn, is one way of preventing and forestalling various kinds of financial-management violations, theft and mismanagement.

At the same time the status of auditing work in civil aviation still fails to fully meet the requirements made of it.

Full staffing of the auditing departments has not been completed in all administrations and associations. Staffing in the Belorussian, Kazakh, Volga, Yakutsk, Arkhangelsk and Estonian administrations of civil aviation is worse than in others.

The collegium made it incumbent upon chiefs of the Ministry of Civil Aviation administrations and Main Agency and of the "Aviaremont" and "Aviastroy" associations to bring the staffs of auditing departments up to full strength, insure unconditional fulfillment of document auditing plans, improve the quality of audits, and insure the more complete inclusion of all aspects of the activities of enterprises, organizations and establishments.

A number of other steps were also taken to improve the status of auditing work in the Ministry of Civil Aviation.

The Ministry of Civil Aviation collegium and the presidium of the aviation workers' trade union central committee adopted a joint resolution on the third matter discussed. A report was heard from V. Tokarev, chief of the Ministry of Civil Aviation Medical Sanitation Administration on improvements in flight surgeons' medical boards in civil aviation. It was noted that within the sector definite work has been done to improve medical boards to determine the state of health for aircrew personnel. Some 22 new flight surgeons' medical commissions have recently been set up. With effect from September 1982 the Regulations on Medical Examinations in Civil Aviation have been in force. These regulations define a number of basically new organizational and medical board approaches. A number of Ministry of Civil Aviation documents aimed at safeguarding the health of aircrew personnel have been published.

New hospitals have been commissioned at the Alma-Ata and Tyumen aviation enterprises, a new polyclinic has been opened in Kiev and the hospital expanded, and a polyclinic has been opened at the Baku aviation enterprise; the level of supplies of function-testing and diagnostic equipment has been raised.

As a result of the work that has been done, work losses by aircrew personnel because of accidents and disease have been reduced.

At the same time, organizational and medical board shortcomings exist in the work of the flight surgeons' medical commissions at aviation enterprises in terms of improving the health of aircrew and air traffic control personnel, improving medical boards and resolving practical questions concerning a healthy way of life.

In a joint resolution the Ministry of Civil Aviation collegium and the presidium of the aviation workers' trade union central committee made it incumbent upon the chiefs of civil aviation administrations and the chairmen of the republic, territorial and combined trade union committees to take additional steps to safeguard the health of aircrew and air traffic control personnel and implement measures to clear the backlog of leave for entitled aircrew personnel and establish strict control over vacation trips taken by pilots, take steps to allocate trips to civil aviation health resorts by PANKh [Use of Aircraft in the National Economy] aircrew personnel, set up rooms at aviation enterprises where aircrew and air traffic control personnel can go to relax psychologically, and enhance the responsibility of the chiefs of the medical sanitation services in organizing the work of the flight surgeons' medical commissions.

Other measures were outlined to improve medical services for aircrew and air traffic control personnel and personnel under training in civil aviation.

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## CIVIL AVIATION

### FIRST TECHNICAL SERVICING OF AEROFLOT IL-86 DETAILED BY CHIEF

Moscow GRAZHDANSKAYA AVIATSIYA in Russian No 9, Sep 83 pp 20-21

[Article by V. Khokhlov, shop chief at the Vnukovo Production Association Aviation-Technical Base: "How We Mastered the IL-86"]

[Text] Our collective was the first in Aeroflot to provide technical servicing for the Il-86. For us this was not just another aircraft replacing its predecessors but a qualitatively new aircraft whose many systems had no analogues in earlier airliners. Taking this into account, it was decided to set up a special shop to service the Il-86.

From the very first days the new unit, staffed with skilled personnel (we selected the most experienced and competent specialists) and with up-to-date technological equipment, was actively involved in the assimilation of technology largely unusual for us.

I think I am not mistaken in saying that work on the new aircraft has given us much, both from the viewpoint of raising the overall professional level of the engineers and technicians, and on the plane of seeking out optimal variants for organizing our work. The creation of the special shop completed justified itself right in the initial stage, providing an opportunity to comprehensively solve the various problems that inevitably accompany the assimilation of anything new. It was necessary to broadly develop technical training and training sessions for personnel. During the initial stage, all workers in the special shop went for training at the plants producing the aircraft. Much valuable knowledge was also passed on at the study sessions conducted by the associates of the special design bureau imeni S.V. Il'yushin. And we have continued to maintain close creation relations with the designers and aircraft builders, recognizing that together we are all involved in the same major and important business.

During the course of training and practical work it was necessary to reexamine more than one ingrained idea and to give up several of the regular, long-established approaches to technical servicing. For compared with the Il-18 and Tu-154, the Il-86 has different dimensions, design, and onboard equipment. For example, the stage-by-stage method used when doing laborious procedures with the Tu-154 was unsuitable: the content of the procedure turned out to be qualitatively different. Here each point in the procedure required its

own technology and work organization and even a different approach to safety equipment. Many systems were qualitatively new: the electric-pulse anti-icing, the onboard navigational complex, and the type of fluid in the hydraulic systems. Or take the extensive use of honeycomb panels in the airframe structures, engine pod and control surfaces; they made special demands on the technology for removing snow and washing ice from outer surfaces. And, of course, the much larger size of the aircraft introduced its own modifications: even a visual inspection must be done differently.

We divided the aircraft arbitrarily into zones: airframe, undercarriage, fuel system, engines, domestic equipment and so forth. Specialization for the brigades was set up correspondingly. This made it possible to speed up the servicing process and the technicians were able to learn more about the design features. Soon, however, we mastered the servicing using overlapping zones. Today, our best specialists, like aviation technicians A. Rusakov, I. Anan'yev, and G. Titskiy and brigade technicians Yu. Shabanov, D. Nechayev, V. Lovtsov, S. Bogdanov, V. Gavrilov and Ye. Furkasov, have gained considerable experience and if required are quite capable of helping their comrades.

Great responsibility was placed on the aviation and radioelectronic equipment specialists. Some work required great skill and keen-wittedness. For example, the adjustments required for the altitude control-point setting elements. The entire measuring complex is located on the flight deck but the adjusters are remote. Checking the oxygen equipment also turned out to be far from simple.

A creative approach to the business was required in full measure, the more so since parallel with learning about the aircraft, work was going on (jointly with the designers and manufacturers) on the servicing equipment itself, as well as the monitoring and testing equipment. During the course of this process our skilled people suggested many original technical decisions. Some of them have formed the basis of equipment that it is intended to put into series production. For example, we could name a control panel for checking the onboard air-conditioning system, proposed by engineers V. Artyukhin and Ye. Belitskiy. Other suggestions have made it possible to substantially improve a number of technologies: servicing the electronic system that regulates engine operation, compensation (the "Spisaniye") for deviation in onboard instruments and so forth. As a rule these innovations have brought savings in fuel and other resources.

It should be said that as a result of the creative work by the specialists at the air base there have been improvements in the very design of the aircraft itself. For example, at first some trouble caused by condensation during flight led to moisture buildup on the metal framework of the aircraft. Now this problem has been successfully solved: metal parts have been coated with a thermal-insulating polymer film that prevents moisture buildup.

Specialization also turned out to be useful when servicing the aviation and radiotechnical equipment. For example, we divided the "instrument specialists" into two brigades to handle the really traditional instrumentation and the flying-and-navigational complex. This made it possible to carry out maintenance work at a higher level. At first it was even proposed that three brigades

should be set up so that the flying and navigational equipment could also be serviced separately. However, it soon became obvious that this kind of division for the closely associated parts of the complex would be ineffective.

When mastering the servicing of the Il-86 much attention was given to diagnosis for its assemblies and units. This kind of approach became possible thanks to the fact that the aircraft is equipped with new, multichannel onboard recording equipment. This enables monitoring not only of the flying equipment on the airliner by the crew but also recording of data on the operation of all the main systems. Here, much credit goes to our flight data interpretation section, which is equipped with rapid-analysis apparatus. In addition, cooperation with specialists at the civil aviation subscriber computer center is helping us to process the growing volume of data.

The diagnosis-and-reliability section has been given new momentum in its development. Using the flight data and also conducting their own independent studies, its specialists evaluate engine status, the airframe and the aircraft systems. Here, for the first time in our sector the automated "Analiz-86" system has been developed and undergone test operations. Using computers, it makes it possible to diagnose the status of the aircraft's most important systems, namely the fuel, control, power supply and other systems.

The technical level of diagnostic work has been greatly raised. For example, the extensive use of computers has required the recruitment of engineer-programmers. And the acquisition of minicomputers has made it possible to eliminate completely the laborious, manual operations, for example, when calculating an engine's throttle characteristics.

Progressive, nondestructive monitoring methods--optical, ultrasound, current-vortex--are used in the studies. In our view, spectral analysis of spent oil is very promising. It enables detection of the smallest deviations from norm in engine operation during their early stages. We do this kind of analysis in a new photoelectric spectrometer. The process for computing its readings is also automated.

The contribution made by the diagnosis-and-reliability section is also substantial. According to data presented by its specialists, along with the designers individual systems in the aircraft have been worked on further and its reliability has been improved. And the aviation technicians are obtaining from the specialists in this section specific recommendations on eliminating defects and improving the operating efficiency of units. For example, when the initial stage of assimilation of the new aircraft was behind us, it was recognized as expedient to assign its operational technical servicing to the shop that had gained great experience in organizing this kind of work on different types of aircraft. Now, the labor-intensive forms of the maintenance routine are carried out by the shop that first specialized on the Il-86, while preparing the aircraft for flight and the uncomplicated forms of servicing are done by another. In order to insure quality fulfillment of the work its staff has been reinforced with personnel and it has been given new equipment.

The tried and tested practice of using particular technicians for particular kinds of work is also employed for operational maintenance. A brigade has

also been formed that specializes in doing the form B maintenance routines. It has been assigned the task of carrying out the entire maintenance routine in one working shift. This form includes a large number of checks, particularly on the domestic equipment, and also the replacement of pump filters. But the brigade is coping with its assignment.

The new aircraft is successfully mastering the air routes. And on the ground the pilots' aides--the specialists of the aviation-technical base--greet it solicitously, inspect it carefully, evaluate its performance with a fine-tooth comb, and eliminate the defects that have occurred in flight. Their labor is also creating a reliable base for success.

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## CIVIL AVIATION

### DIRECTOR SEEKS IMPROVEMENTS AT KAZAKHSTAN AVIATION REPAIR PLANT

Moscow VOZDUSHNYY TRANSPORT in Russian 25 Aug 83 p 2

[Article by V. Krivosheyev in the column "Discussions at a Meeting of the Sector Command Personnel and Party Aktiv": "Taking the Long Term into Account"]

[Text] Our plant is well acquainted with pilots and technicians from far beyond the borders of Kazakhstan. After they have received a new lease of life, An-2 aircraft and Ka-26 helicopters continue to operate in Kazakhstan and the Far East and in the Central Asian republics and the Komi ASSR.

However, this has been known for a long time, and I would therefore like to get down to business immediately--to the problems that now face the collective.

Whereas at other civil aviation aircraft repair plants there has at one time or another been rapid construction of modern buildings and the reconstruction and expansion of old production areas and the installation of up-to-date equipment and technological lines, for certain reasons this has barely concerned our enterprise. As a result, using centralized funds we have constructed only two production premises, namely a small compressor station and a building for assembly repairs.

However, the tasks of organizing the repair of aircraft have become increasingly complex with each passing year: the plans call for more and more aircraft to be rebuilt by our collective. And accordingly we have needed to constantly build up the rates of intensification for the main and auxiliary production sections. How? Naturally, first by increasing the capital/output ratio of available equipment and apparatus, increased labor productivity, improving work standards and developing the plant's material-technical base.

The collective undertook a major initiative to solve this part of the program. And today's results, or rather the attitude of our specialists toward any problem, enables me to say, with hand on heart, that the desire to work hard has not only been stimulated in people by the aspiration to be constantly concerned for the needs of production, but has also forced them to show an interest in the organization of everyday affairs.



In the early days a careful analysis was made of the state of affairs in each shop. This made it possible to organize continuous positive flows to the fuselage-repair, aircraft-assembly, and wing-and-tail-unit-varnishing sections. Then a group of the plant engineers who had studied the experience of other plants worked out the most economical scheme for the production process and the allocation of equipment, and this led to high work specialization. The innovators provided active help in this. They invented sorting trolleys for groups of aircraft assemblies and units and original undercarriage dummies for moving fuselages around. The aircraft in the hangar were first set crosswise to the doors and their own power rails and dollies were set beneath the undercarriage; and then later, at a slight angle. This was done so that they could be placed wing to wing. And it seemed that many more aircraft could be housed in a small but densely packed area. At the same time, new flow-lines were commissioned for repairing wings and applying the enamel. But after some time the area for aircraft repair and assembly was again inadequate.

What was to be done? Each last square centimeter of space was being used at maximum load. Again we searched for an optimal variant, thinking about the theoretical calculations and setting them up in practice. The result was that just one condition was needed for solving the problem: the duration of the production cycles must be reduced. The plant became the sector initiator of the movement to reduce the time taken to repair An-2 aircraft without detriment to the output quality. Thus, for example, the problem with the repair of wings and tail units was resolved by setting up crosswise flow-lines for their assembly. The production possibilities of the section immediately doubled. The technological sequences in other shops were similarly restructured.

For a long time our assembly workers and riveters worked cheek by jowl. They even sometimes hampered each other. And their work used to proceed more slowly than was required. But here too we found a solution: we acquired and installed a production dock from No 409 civil aviation plant. Then we provided heat for it, brought compressed-air lines to the working places and equipped a heating system using a fixed kerosene heating unit. Five rotating devices were installed in the floor for the fuselages, once again designed and fabricated by the skillful people at the plant. This special section for riveting the An-2 fuselage was commissioned in 1981. Other problems were solved in a similar way. For example, so as to avoid having to paint the aircraft in the open air, as had been done for many years previously, another dock was set up for the painters alongside the riveting dock. Production standards rose in this section and the rate of work and the quality of aircraft painting improved.

And all this was done by the efforts of the plant collective. This is why it took us 8 years to construct the premises for the aircraft assembly and varnishing sections. And although we managed to get everything under cover and then install an LP-1 semiautomatic line, engineering service lines for the enterprise were set up at a different time and by different people, without a general plan and without blueprints. As a result, the entire system has needed replacement for a long time. This became particularly obvious during the period when we had to set up for the repair of the Ka-26 helicopters.

All the measures listed above enabled us to meet our production targets, but now, in my opinion, we have reached our limit: our production sections are overloaded several times over; for a long time it has scarcely been possible to walk or drive between the buildings and the equipment. The plant has essentially exhausted its last organizational and technical possibilities in terms of improving work efficiency and quality. The production base does not meet today's requirements in terms either of the area and cubic capacity of the production premises or in terms of their condition. The engineering service lines, I repeat, require immediate replacement. The most immediate prospects envisage the startup of repair for the new L-410 and An-28 and other modern aircraft, and this will exacerbate the question even more.

And so today we face a major problem: to start on the reconstruction of the plant, proceeding on a broad front, and to construct new buildings and install modern equipment in them. We have made this proposal repeatedly to the "Aviaremont" management. At one time it seemed that the point had been made and that we would start work in this direction: on orders from the Ministry of Civil Aviation leadership, last year specialists from "Kazaeroprojekt" worked up a "Scheme for the Development and Accommodation of No 405 Civil Aviation Plant," taking into account the immediate prospects for its work. According to this scheme the expansion of our territory could be accomplished only by using some of the warehousing area of the Kazakh Administration of Civil Aviation and the Alma-Ata aviation enterprise adjacent to the plant. We sent all the necessary documentation to the management of the administration and the aviation enterprise and we expected a positive decision and help in developing the repair production facility.

But there is still no answer. Even though we have been waiting for 7 months. I hope that the management of the Kazakh Administration of Civil Aviation will understand me correctly and respond to our request. For, as the minister of civil aviation B.P. Bugayev stated in his report at the 15 July meeting of the sector command personnel and party aktiv, "the further development of the ground material-technical base is an important condition for improving the efficiency of our work."

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## CIVIL AVIATION

### KIEV AVIATION PLANT SUPPLIES CONSUMER GOODS

Moscow VOZDUSHNYY TRANSPORT in Russian 21 Jul 83 p 3

[M. Lyakhovetskiy report: "Not Scrap But Business"]

[Text] At the No 20 Kiev plant production has been started up on cultural and everyday goods made from production waste.

Somehow I got involved in organizing my own personal records. For the papers I needed regular files made from polyvinylchloride sheeting. I went to several stores. No luck! I got one and same answer from the sellers: no, we have never seen them.

Once I happened to be visiting the museum of labor glory at the Kiev No 20 civil aviation testing and experimental plant. Among the samples of items produced by the plant I saw some cultural and everyday articles. They included the files that I needed so badly. And the display notes stated that in 1982 in accordance with a resolution of the Kiev city soviet of working people's deputies ispolkom, the presidium of the city trade union council and the bureau of the city Komsomol committee, No 20 plant was placed second among enterprises not specializing in the production of cultural and everyday goods for its output of consumer goods, and had been awarded a challenge pennant and a money prize, and also an entry in the Book of Labor Glory for the 11th Five-Year Plan.

As is known, the "Aviaremont" association, of which No 20 plant is part, does not have plans for a products list of an output volume for consumer goods, and so it does not allocate material or labor resources for their production.

"How, then, do you solve the question of producing consumer goods?" I was interested to know from the chief of the plant's planning and economic section, A. Vlasik.

"Through overfulfillment of the main plans and improvements in labor productivity," Aleksandr Vasil'yevich explains. "We used unfunded materials. We only have to be persistent. In particular, we use production waste. We have a lot of it: metal for disks in water sprayers, and here we have film for paper files..."

They showed me the place where for many years waste film has been accumulating; it remains after the publication of sets of recommendations for crews for dealing with unusual flight situations.

"They can be scrapped or thrown away," the section chief Aleksandr Ivanovich Gavrilenko had said.

But he was only joking. When the time came this waste was put to work.

We might add that these same scrap files are also used to make the little folders for tickets on the city transportation. The Kharkov cultural trade association has ordered 20,000 of them. In addition, in 1983 some 10,000 door latches will be produced at the plant (incidentally, the doors in the new building for one of Kiev's largest museums are fitted with these latches), along with 10,000 water sprayers for orchards and private plots, cassettes for paper, tweezers, and 100,000 polyvinylchloride paper files.

At No 20 plant the production of cultural and everyday goods is not regarded as a nonobligatory or secondary business. Neither the plant director, V. Pinchuk, nor the shop chiefs K. Dekhtyarenko and A. Malikov think this. On orders from the plant director engineer V. Rudnitskiy has been assigned responsibility for developments, studying demand and market conditions, and organizing the production of these articles.

In 1985 the production volume for consumer goods will increase 59.4 percent at the plant compared with 1980. There are prospects for extending the range of products. Thus, for example, the chairman of the Kiev city soviet, V. Zgurskiy, has asked the plant director to organize the production of partition-locking devices for houses. The demand for these items is enormous.

In cooperation with one of the plants in Kiev the production of the electronic part of the partition-locking device has been started up.

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## CIVIL AVIATION

### KHARKOV AVIATION REPAIR PLANT BEGINS WORKING ON L-410 ENGINES

Moscow VOZDUSHNYY TRANSPORT in Russian 10 Sep 83 p 3

[V. Leonid report: "Born out of Cooperation"]

[Text] No 420 civil aviation repair plant has started working on the maintenance of the engines for the Czechoslovak-produced L-410, which is being operated increasingly extensively on local air routes. A new technological complex has gone into action. Czechoslovak specialists participated actively in setting it up. High-speed diagnostic installations, test benches for testing the complex assemblies and repair and assembly instruments have been delivered to Kharkov from the fraternal country.

"The plant administration and party organization have done a great deal of work to mobilize the collective to fulfill this crucial task," the plant chief technologist P. Kolosov reported. "Several groups of our specialists have been to Czechoslovakia for training. Enterprises in Moscow, Leningrad and Dnepropetrovsk have also been a great help in assimilating servicing for the engines. Businesslike cooperation with the collective of the All-Union Scientific Research Institute for Surface-Active Substances has also been successful. A new technology for washdown and operational preservation of components between maintenance procedures has been developed and introduced through their joint efforts, and this has made it possible to improve working conditions and abandon the expensive imported detergents.

The purposeful work by the collective of civil aviation repair plant No 420 and the help from our Czechoslovak friends made it possible to complete maintenance on the first batch of L-410 engines in July this year and dispatch them to operational enterprises. An interdepartmental commission has given the plant the go-ahead to start work on series repair of these engines.

At the same time, some questions remain to be solved. Reconstruction of the motor production facility must be completed, a number of modified technological processes must be mastered, and the assimilation of repair on all units must be completed. But the most important thing is to solve the organizational problems that are hampering a sharp increase in the number of engines serviced.

## CIVIL AVIATION

### NEW GRADUATES GIVEN INTENSIVE TRAINING ON MORE ADVANCED AIRCRAFT AT ULYANOVSK

Moscow VOZDUSHNYY TRANSPORT in Russian 4 Oct 83 p 3

[O. Kulikov report: "Dictated by the Times"]

[Text] Do you think that an An-2 pilot can convert in the regular time period to the latest modification of the Tu-154? Two or three years ago even the question itself would not have been taken seriously, because pilots move on to heavy aircraft slowly, gradually mastering various machines. Take a look at the flying log of the captain of a Tu-154 and the list of aircraft that he has flown will speak for itself--An-2, An-24, Il-18, Tu-154.

But the times make their own dictates. And specialists at the CEMA Civil Aviation Center have been conducting an experiment: a group of graduates from the Aktyubinsk Advanced Flying School went to Ulyanovsk after they received their diplomas, and the young pilots converted to the Tu-134. The first group was closely monitored, because the fate of the new form of training depended largely on the flying performances of the Aktyubinsk people. The results were hopeful: not a single reprimand was addressed at the Aktyubinsk pilots from the production units.

Aviation specialists from the countries of the socialist community are interested in the new training method. And this is no wonder, because the prospects from this kind of training are very great. Whereas now pilots start to fly the major aircraft mainly when they are aged 40-45, the people from Aktyubinsk with the advanced engineer flashes on their shoulders are sitting in the captain's seat in modern airliners when they are 30. They will have the wonderful opportunity of perfecting their skills on the same type of aircraft.

At the request of the "Malev" aviation company, a group of aviators from Hungary underwent conversion to the Tu-134 at the center. Now a new group of Hungarian pilots and flight engineers is in training. I met them on the day when the fliers from the fraternal country had been sitting an examination in theoretical training--aircraft design.

This is what (Bikhari Derd') said about his comrades: "Our group is a composite one this time--pilots and flight engineers. But training is on the same aircraft, the Tu-154. Whereas for the flight engineers this is regular, because almost all of them have flown on heavy aircraft, our pilots, it must be frankly stated, have made a huge leap, for until quite recently they were An-2 commanders."

While we were talking the examination came to an end. (Kish Chabo), (Fabian Laslo) and all the other members of the group had all successfully coped with the questions that had been set. And we are talking about the Tu-154, a modern aircraft with a mass of very complicated instruments.

"Has the training been difficult?" I asked (Kish Chabo).

"Of course, it's that kind of aircraft. But I must say that we would never have successfully mastered this equipment but for the instructors at the center. We pilots had a lot to learn and relearn but we have never met such a skilled set of instructors as those in Ulyanovsk. The training here is done simply, intelligibly and graphically. And indeed the whole atmosphere surrounding us has helped our successful studies. We have been living in the wonderful new 'Druzhba' hotel only a small step away from the training building, and we have had the use of a fine library..."

Now the Hungarian friends are moving on to the simulator. After 20 hours of "flying" on it, the airfield at the center will greet the new Tu-154 pilots and flight engineers.

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## CIVIL AVIATION

### CENTRALIZED REFUELING SYSTEM TESTS SUCCESSFUL AT YEREVAN AIRPORT

Moscow VOZDUSHNYY TRANSPORT in Russian 6 Oct 83 p 3

[Report by L. Muradyan, chief of the fuel and lubricants section in the Armenian Administration of Civil Aviation: "A Replacement for the Heavy Fueling Vehicle"]

[Text] Testing has been completed at the Yerevan Zvartnots airport on a centralized aircraft refueling system.

In cooperation with specialists from "Aeroprojekt" and construction workers from the "Armaviaremstroy" trust, in a relatively short time we have succeeded in completing a complicated but interesting engineering project that generates a high savings effect.

When the centralized refueling system was being developed, consideration was given to both Soviet and foreign experience in planning and constructing similar installations. The system is designed for the refueling of aircraft directly at the hard-standings on the apron, which have been equipped with special permanent devices. The centralized refueling system can handle the Yak-42, Tu-134 and Tu-154, and the possibility of using it for the Il-86 airbus is not excluded. In terms of productivity it is more than twice as good as using heavy refueling vehicles, and it is able to handle refueling for five aircraft [at one time]. The system was planned and built taking into account its further development as required and an increase in the number of aircraft that can be refueled.

Two lines of an underground pipeline link the fuel and lubricants storage dump with the complex around the airport buildings at Zvartnots. The 30 outlets from the pipelines not only reduce to a minimum the time taken for refueling but also completely eliminate delays caused by refueling. Problems associated with atmospheric pollution, possible mechanical damage to aircraft and fire hazards have all been taken into account.

Now the most important and crucial period is starting--introducing the new system. Its operation will begin on the eve of the holiday for the Great October.



## CIVIL AVIATION

### OPERATIONS AT TYUMEN AVIATION REPAIR FACILITIES

Moscow VOZDUSHNYY TRANSPORT in Russian 4 Aug.83 pp 2-3

[Article by V. Pikalov, shop foreman at No 1 shop, No 26 civil aviation plant, V. Kisloshchuk, chairman of the head group people's control, and A. Mokrousov, VOZDUSHNYY TRANSPORT correspondent: "In the Focus of Attention: Internal Production Reserves"]

[Text] Struggling to implement the decisions of the 26th CPSU Congress and fulfill the plan tasks of the 11th Five-Year Plan to satisfy demand from consumers and the national economy for aviation facilities, the many-thousand-strong collective of civil aviation is resolving yet another important problem, namely to transform Aeroflot into a standard for transportation. Collectives of the plants belonging to the "Aviaremont" all-union state industrial association are also working to fulfill this task. The efforts of the people at the plants are aimed primarily at raising the level of planning, technological, execution and labor discipline, reducing schedules for and improving the quality of aviation repair work, introducing the achievement of modern science and leading experience, and solving the long-term questions of the development of aviation repair work.

The initiative of the collective at the Minsk Plant No 407, which is working under the slogan "From Savings in Repair Work to Improving the Efficiency of Work in the Sector," is being broadly supported at the aviation repair enterprises.

The VOZDUSHNYY TRANSPORT editorial office with the aid of its active aides--the nonstaff correspondents--is starting an inspection campaign at the aviation repair enterprises. The purpose of the inspection campaign is to show how the plant collectives are solving the task of transforming Aeroflot into a transportation standard, generalizing work that has been done and leading experience, revealing production reserves and analyzing existing shortcomings.

Tyumen--Next year will be the 40th anniversary of No 26 plant. It has enjoyed a happy fate: throughout all these years the enterprise has been at the spearhead of development in the Tyumen North. Until quite recently only two roads went through to the high latitudes, by water and air, and the An-2's and Mi-2's serviced at the plant were frequently the only means of transportation available for fishermen and hunters, geologists and oil men...

But times have changed, and on the eve of the plant's 40th anniversary we can justly say that today it is being reborn. Reconstruction is taking place on a broad front, and its workers are learning to handle something new--the servicing of the first-class Mi-8 helicopter.

Life itself has brought forth these changes. The Tyumen Administration of Civil Aviation is one of the largest in the national economy in terms of work volume, and as is known, the "number eight" is the number one aide in this administration. Many of them are operated in our area, but until recently the Mi-8's had to go to Bykovo, Novosibirsk or Omsk for servicing.

The plant director, V. Cherepanov, is confident: "By the end of the five-year plan we shall be handling 65-70 percent of the "number eights" in the administration. This will also be our contribution to the work of transforming Aeroflot into a transportation standard."

Valeriy Petrovich's optimism is based on a firm foundation. Starting with the rebuilding of seven helicopters in the first year of operations, the Tyumen people are now building up this number in geometric progression.

Of course, doing this is not easy. First-class equipment requires a corresponding knowledge and skill, and improved labor organization. Today, you would no longer recognize many of the sections, and preparations are being made for the startup of a mechanized washdown line and the construction of a new building that is to house the assembly shops is going ahead at full speed. But...

"The startup of the washdown line and the section for degreasing assemblies is being delayed by the inadequate capacities of the boiler shop. The scheduled time for the commissioning of this building is approaching and the matter is becoming increasingly acute. We are placing our hopes in the startup of the Tyumen TETs No 2. But, if we allow time for setting up the mains services, in the best case this will be about 7 or 8 years. And the helicopters are needed today."

"The 'Sibkomplektmontazh' association makes fine boiler units," we remind him.

"They are simply wonderful! You set it up, connect it to the mains services and you have heat. We shall need two of them, at least until the TETs is operating. In general we have agreement in principle with the association; now we are just waiting for the word from 'Aviaremont'...

"I like to think that the plant will get the boiler units just the same; there is simply no alternative. And they are compact: you will agree that space constraints are also not unimportant.

"Although, incidentally, we have encountered yet another problem. In terms of production area we have adequate space, but the workers of the flight testing station have recently found themselves in a difficult position. The single helicopter pad allocated at the Plekhanovo airport is now inadequate. What will happen when the plant is sending out two or three times the number of helicopters for testing than at present?"

There is nowhere to expand. The enterprise is surrounded by the Plekhanovo airfield, a city, and the arable land of the agricultural institute. Of course, some of the land could be allocated--with a certain effort. But for whatever reason, up to now the plant management has not made this effort.

"Building up the production base is an important part of our development, but by no means the most important one," V. Cherepanov stressed in conversation with us. "We are focusing the collective's attention first and foremost on improving production and seeking out internal reserves."

There are, of course, many difficulties. In many ways the flow-line work method is new for the plant, but still, whereas 2 years ago they were sending more than 50 assemblies to Omsk and Novosibirsk under the terms of the cooperation, today they are already repairing many of them themselves. The production structure is being improved and it can be said that the search is going on at every work place.

We saw the reequiped systems and assemblies repair section; they are especially careful with these at the plant. Consideration is given to all factors that could affect productivity and work quality. Setting up the machine tools is a real science.

During the days when we were conducting the inspection the first helicopter arrived whose assemblies were passed through the sections while being monitored by the coupon system. This is a progressive measure and initially not everything has been going as well as might be desired.

"They are supposed to sign the coupons, but I still do not see them all here." The foreman of the Mi-8 and Mi-2 repair section. V. Shneydmiller, irritably poked a finger at the trolley on which lay an untidy heap of papers.

We sympathetically shook our heads. He was right: the effect of coupons had been made useless...

The sector normative for the repair of an Mi-8 helicopter is 33 days. A year ago the Tyumen people were taking up to 50 days. Today this is already much less, at 39 to 37 days.

"All the same, there is a lot..."

"There is a lot," deputy director N. Motoshin agreed. "Not all the sectors are maintaining the cyclic schedule, primarily the machine stripping sector."

We talked with the specialists and workers in this section and we reached the following somewhat paradoxical conclusion: in order to keep up unconditionally

with the schedule it is necessary to build up the volume of repair work. And this is why.

Today, six people work in the stripping section. There cannot be more because the amount of work does not permit it. And as a result quality suffers. As a rule, one "number eight" at a time is handled here, and the six people can scarcely deal with it in four days. Now imagine that two helicopters arrive at intervals of 2 days. There would be an obvious need to increase the number of fitters, and an opportunity, even a need, for them to specialize on particular operations. In other words, a unique conveyor, a technological flow-line would be set up.

But, we repeat, in order to get to this, the volume of repair work must be increased. This is why it is essential to recognize as incorrect the desire that still exists among some workers to retain a considerable number of Mi-2's in the plan for 1984. Of course, it will not be easy once again to double the number of "number eight's" repaired. But objective necessity requires this--the interests of production, and perhaps also the interests of the administration that the plant serves--are the ultimate concern.

There is still another initiative that the plant has not been able to "enter" in the sector normative. As we have already said, dozens of assemblies are still being sent to Omsk and Novosibirsk for repair. They are frequently returned from there with unacceptable delays. We do not intend to talk about how their colleagues are letting them down; they are, of course, closer to their own neighbors' plans. The most radical solution is to repair the assemblies right here in Tyumen. And for this, equipment and the necessary test benches are essential. It can be said that they have prepared about 20 of them themselves. There are not capable of handling others, for example, transmissions and lifting systems. This cannot be managed without help from "Aviaremont."

... During the course of the inspection we found many sore points in the enterprise. For example, labor intensiveness here is high, but the complex of measures undertaken at the plant in the last 6 months alone have reduced it 10 percent, and the possibilities are far from exhausted. And the final introduction of the coupon system and the work being done today by the production mechanization and automation section will in the near future make it possible finally to bring this work up to the norm.

The proportion of technical sound norms still remains low, although it is increasing more rapidly than planned, for example, for this year. The trouble is temporary and associated directly with the assimilation of new equipment; and thought should be given to enabling the plant workers to remove this item from the agenda quickly.

Personnel shortages have become chronic here. Today the enterprise is unable to offer its own workers even a hostel, even less well-appointed apartments. It is only thanks to the "kind aunties" from the neighborhood kindergartens, who sometimes help the plant with transportation as a patronage project, that

it has been possible to find places for five one-year-old infants. And you cannot explain this by growing pains. Serious help from the Ministry of Civil Aviation and "Aviaremont" is required here.

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## CIVIL AVIATION

### QUALITY OF INSTRUCTION AT FLIGHT SCHOOLS FAULTED

Moscow VOZDUSHNYY TRANSPORT in Russian 18 Aug 83 p 3

[Article by instructors Ye. Medvedev and V. Chigarin: "Does the Instructor Need Specialization?"]

[Text] Ku byshev--Engineers and instructors working in the study and training units are called upon to enhance in every possible way the professional training of pilots, navigators, air traffic controllers, flight mechanics, flight engineers and aviation engineers. However, when analyzing the situation in which most instructors find themselves, you reach the alarming conclusion that they have at their disposal very poor facilities to carry out their service duties at the level of present-day requirements.

For example, instructors at our study and training unit provide instruction for retraining and advanced proficiency ratings for aviation specialists and checks on knowledge for the reissue of pilot licenses and the issue of upgraded class licenses for aviation specialists operating 13 different kinds of aircraft. The frequency of sessions for particular types of aircraft varies greatly and depends mainly on the number of aircraft of a given type available in the inventory of an administration.

For example, whereas three or four sessions are planned each year to provide retraining for engineering and technical personnel for the An-2 and up to 20 to improve pilot skills on the An-2, the sessions to retrain flyers and improve their skills on the An-12, Ka-26, Mi-2 and Mi-4 and the sessions for initial training for aviation mechanics are planned for once a year but in practice the plan is often frustrated and they actually take place once every 2 or 3 years,

The existing procedure leads to a situation in which, for example, instructors for the cycle of the material part of the aviation systems, for which a standard reading time of 108 hours is allotted, have to deal with six or seven types of engine and five or six types of airframe, plus disciplines such as oil and lubricating materials, materials science, fitter's work, safety equipment, civil defense, and emergency rescue work. Take instructor P. Afonin. He handles sessions for the An-2, L-410, Tu-134, Tu-154, and An-12, and also civil defense and emergency rescue work. One of the authors of this article takes sessions on seven types of engines and in addition, within the group of initial training sessions for aviation mechanics, teaches courses on oil and lubricating materials, safety equipment and materials science.

We see that a single instructor is involved in quite different disciplines. And there is, of course, virtually nothing in common in the design and technical operation of the engines studied, plus the fact that they are being constantly improved and that their operation is being constantly altered both on the ground and in the air, and both positive and negative experience in their operation is being gained... But the instructor must not only report all this to his students but also make them technically competent. Instructors handling the AiREO [possibly aviation and radioelectronic equipment] and aerodynamics cycles do not find themselves in the best situation.

It is scarcely necessary to point out that the existing "encyclopedic" nature of the work in no way promotes improvement in the quality of instruction. Moreover, under these conditions it is extraordinarily complicated to provide classes with full sets of visual aids for teaching and to use technical facilities for training. The expensive equipment that is supplied to our unit is being poorly used.

Many classes in the AiREO cycle, particularly the cycle for the material part of aviation systems, are literally weighed down under a mass of visual aids, while in study sessions for the An-12, Ka-26, Mi-2 and Mi-4 and other disciplines, in a best possible case the instructor has only a poster at his disposal.

And this is understandable: you cannot get everything you need in one classroom. You have to use the corridors. When we started the training class for the Il-76, which requires a considerable area, we were forced to throw out all the meager equipment for other types of aviation systems in the unit.

Meanwhile, at a cost of R167,000 (not counting the engine mockup), it is planned to hold only two sessions each year to retrain engineering and technical services to offer retraining for the Il-76; this is less than 15 percent of the available facilities. In the Tu-154 class, at a cost of R90,000 (not counting the engine mockup) two or three engineering and technical services groups will be retrained and two sessions will be held to improve crew skills, that is, slightly more than 15 percent of available facilities. The coefficient of use for training classes for the An-24, Tu-134 and Yak-40 is just as low.

All the above indicates that the time has come to introduce specialization in the study and training units.

We think that it is now expedient to introduce specialized study and training units at the ministry level for those types of aircraft that are not greatly used in the administrations. In the future this type of specialization could also be organized for types of aircraft whose operation is being phased out. A partial or if possible, regional specialization by two or three neighboring units also suggests itself for the aircraft used most extensively in their administrations. When new equipment is assimilated, in the early days a number of study and training units should be organized for retraining on the new type of aircraft.

We would like to know the opinion of instructors in other study and training units on this problem, and also of workers in the corresponding administrations of the Ministry of Civil Aviation.

SCIENTIFIC-PRODUCTION COOPERATION IN BSSR MOTOR VEHICLE DEVELOPMENT

Moscow MASHINOSTROITEL' in Russian No 7, Jul 83 pp 3-5

[Article by Academician P.I. Yashcheritsyn, doctor of technical sciences, and Professor M. S. Vysotskiy, chief designer at the "BelavtoMAZ" [Belorussian Motor Vehicle Plant] Production Association: "Avtofiztekhn" [Motor Vehicle Physical Technical Scientific Production Association]--A Fusion of Science and Production"]

[Text] Acceleration of scientific and technical progress is one of the primary conditions for the steady, continual development of the country's economy. It was emphasized at the 26th CPSU Congress that the most vital, key sector today is the incorporation of scientific discoveries and inventions. Speaking at the November (1982) Plenum of the CPSU Central Committee, comrade Yu. V. Andropov, general secretary of the CPSU Central Committee, devoted special attention to the large reserves in the national economy which must be sought out in order to speed up scientific and technical progress, and to incorporate rapidly and extensively scientific and technical achievements and advanced methods into production.

The shortest and most effective path for accelerating technical progress in motor vehicle production is the practical application of new scientific solutions. Much of what has been outlined for the motor vehicle industry in the "Basic Directions for the Social and Economic Development of the USSR for 1981-1985 and up to 1990" is addressed directly to the collective of the "BelavtoMAZ" Production Association. Specifically, these directives include developing production of new, highly efficient dump trucks for carrying especially large loads of sand and gravel and general purpose dump trucks; increased production of trailers and semi-trailers for trailer trucks; expanded production of container trucks with a carrying capacity of 20 and 30 tons; improved effectiveness and quality in scientific research; and more rapid incorporation of research results into the national economy. Integration of science and industry and drawing a large number of scientists into the production process help promote the incorporation of scientific achievements and guarantee the greatest economic effectiveness.

An example of this kind of integration can be seen in the experience of Belorussian workers engaged in building motor vehicles. The powerful trucks from the Minsk Motor Vehicle Plant, Belorussian Motor Vehicle Plant, and Mogilev Motor Vehicle Plant that are used in the construction of the Baykal-Amur



Mainline, the Kama Motor Vehicle Plant, the largest hydroelectric power stations in Siberia, and in mining pits and quarries, embody not only the labor of the workers, designers, and engineers, but also the scientists' creative thinking.

The Belorussian motor vehicle workers have long understood that periodic contacts with scientific institutions, based on economic agreements, are far from adequate, especially where an association on the scale of the "BelavtoMAZ" is concerned. Maximum acceleration of scientific and technical progress is possible only under conditions of in-depth, fundamental scientific research, backed up by purposeful applied research, and followed by planning and design work.

The Minsk Motor Vehicle Plant (the main enterprise of the "BelavtoMAZ" Association), institutes of the BSSR Academy of Sciences, and the Belorussian Polytechnical Institute (BPI) were some of the first organizations in the republic to establish close, effective contacts; in order to accomplish this they made use of new organizational forms for ties between science and production. It should be mentioned that this cooperation calls not only for scientists to help collectives in the association's enterprises to improve production; it also calls for plant specialists to help scientists by providing them with an experimental production base, offering them assistance in terms of material and technical supply, and so on. The important features of this type of cooperation are exchange of information at joint conferences and extensive contact with social organizations, which helps improve the political and educational work among the association's collectives, the BSSR Academy of Sciences institutes, and the BPI.

There was a time when institutes and enterprises existed totally independently. We need only look back as far as the time when the Belorussian motor vehicle industry was just emerging. At that time science had not invaded production as broadly as it has today. Today it is impossible to conceive of science and production without one another. At the present, the work of an institute is judged in terms of how well its developments are incorporated into production; and one cannot imagine contemporary production without the participation of science. As more scientific forces and ideas are drawn into production, contemporary production improves; the possibilities for this are great, especially in large associations.

With the aim of accelerating operations to create and incorporate new technology, a set of measures has been implemented at the main plant over recent years to strengthen the plant's own scientific and technical potential; these have included organization and development of experimental and design services, central plant laboratories for different types of production and basic technological directions. One of the reasons for the accelerated incorporation of scientific developments was the creation of a scientific sector at the "BelavtoMAZ" Association, something unique in an industrial enterprise. Its engineers and technicians participate directly in scientific research, which makes it possible to carry out work that is comparable to that of a scientific research institute, both in terms of volume and importance. In addition to this, the plant's scientists do a great deal of independent research; the sector helps VUZes, industrial scientific research institutes, and academic institutes to bring their developments to completion. It is no secret, after all, that the

research base of scientific research institutes and higher education institutions does not always allow production of an industrial model of a new mounting or a new machine tool.

Many topics are becoming the subject of joint research studies and are being "attached" to specific production conditions thanks to the help of the plant scientists. The Minsk Motor Vehicle Plant, for example, was the starting point for a method now being implemented at other plants; the method involves treating components with surface plastic strain and was developed in collaboration with scientists from the Physical Technical Institute of the BSSR Academy of Sciences. The group of collaborators from the institute and the plant won the BSSR State Prize for their work. Today at the plant methods are being applied that were developed at the Physical Technical Institute; they include hot, hydrodynamic pressing of articles with complex contours, hydrodynamic stamping, and so on. The economic effect of incorporating the new processes has been over 3 million rubles. The plant has helped 54 enterprises throughout the country to develop progressive manufacturing processes. Eight of the republic's academic institutes collaborated with the plant on the research.

The scientific potential and the nature of the applied research being conducted by a number of institutes of the BSSR Academy of Sciences, and the long-standing creative contacts between motor vehicle plant workers and scientists, have provided a strong foundation for the development of new forms of cooperation. There is now a need to seek new organizational forms for these ties, which will eliminate the existing shortcomings, provide a sharp increase in joint scientific developments, improve their quality, and guarantee greater utilization of the scientific potential of academic institutes.

It was for these reasons that the Minsk Motor Vehicle Plant and the BSSR Academy of Sciences made a joint decision to organize at the enterprise an academic department for problems involving research on trucks. The department's activities are defined in a charter that was approved by the directors of the plant and the Academy. The department has been fully staffed with personnel and conditions have been created for economic and creative operations, including production and testing of models, and incorporation of research results.

The department is headed by the chief designer of the "BelavtoMAZ" Association and the scientific and methodological leadership is provided by the Department of Physical and Technical Sciences of the BSSR Academy of Sciences. The basic directions of the scientific research, and the five-year plans and annual plans for the department's operations are developed on the basis of the plant's plans for testing, design, and scientific research operations and on the basis of directives from the Presidium of the BSSR Academy of Sciences. The department is responsible for developing the directions of scientific research that it has been assigned, and for the effective utilization of the research results in the national economy. In accordance with the structure that was approved for the department, seven laboratories have been created.

Between 1975 and 1981 the department was responsible for the following developments:

--A system for producing large-capacity trailer trucks, which made it possible to establish before 1990 model types of standardized trucks with large and extra-large carrying capacities, and to develop optimal series of engines, transmissions, and general parameters for large-capacity trucks;

--Computer programs for calculating the most complex dynamic systems in motor vehicles, which brought a significant reduction in the amount of time needed to design future motor vehicle equipment;

--A method for determining the number of gears for trailer trucks with hydraulic transmissions; the method was also used to develop the engineering specifications for hydraulic transmissions in other motor vehicles.

All the institutes of the Physical and Technical Sciences Department that had the opportunity to plan fundamental research in the area of motor vehicle production, taking into account the more precise demands of practical experience, were included in the resolution of these problems.

The academic department, in collaboration with institutes of the BSSR Academy of Sciences, has conducted scientific research operations within the "BelavtoMAZ" Association, the results of which have been incorporated into production. The most important of these are:

--The development and implementation of probability methods for designing machinery components in terms of dynamic loads using a computer; this work was done with the participation of specialists from the association and scientists from the Problems of Machinery Reliability and Durability Institute of the BSSR Academy of Sciences; these methods made it possible to improve the design of key parts in the power transmissions of motor vehicles and to increase their running time without making any major repairs. The economic effect of incorporating these developments was 1.25 million rubles;

--The joint development and production, with the Technical Cybernetics Institute of the BSSR Academy of Sciences, of an experimental model of an on-board computer complex for studying the vibration load in the driver's seat of motor vehicles from the Belorussian Motor Vehicle Plant and an automated system for analyzing the test results;

--The joint development, with the Heat and Mass Transfer Institute imeni A. V. Lykov, of methods for studying the heat currents in truck cabs;

--Joint research, with the Applied Physics Institute of the BSSR Academy of Sciences, on evaluating the distribution of the maximum load in design elements of truck cabs, bodies, frames, and so on, using a method of magnetic topography showing changes in the residual magnetic field.

The many years of cooperation with the Mathematics Institute of the BSSR Academy of Sciences has had a great influence on the incorporation of contemporary computing technology into motor vehicle research and design, and in assigning final technical specifications. The most complex programs have been developed using the institute's computer center and programming laboratory as a base. Included among these complex programs are programs used to calculate indicators

for how smooth the vehicles operate while in motion, traction dynamics, and fuel economy of trucks and trailer trucks when they are travelling on roads with irregular contours.

The set of operations implemented by the institute's academic department provided an economic effect of about 16 million rubles between 1976 and 1980; the effect was due to introduction into the national economy of the truck and trailer truck designs from the Minsk Motor Vehicle Plant. Joint work between specialists and scientists improves the skills and speeds up the training of the association's scientific personnel. The set of research studies and developments that were carried out made it possible to raise the level of scientific research at the association's plants, and to develop designs that are on the level of inventions. For the first time in domestic motor vehicle production, a family of motor vehicles, the MAZ-500 series, has been built using a progressive design for a cab over the engine that can be tipped over. This makes it possible to increase the carrying capacity; to make better use of the length of the truck through a rational arrangement of the components; and to provide free access to the engine and its systems. The transition to this model was made possible by some fundamentally new design solutions for a series of assemblies for which patents have already been obtained: there is a new transmission that is patented in many countries; a telescoping steering column; and a mechanism for opening and closing the cab that flips over.

For the first time designers have solved the problem of opening and closing the back side of a dump truck, and of loading the truck, without having the driver leave the cab. They have also developed a way to attach empty log-transport trailer flats to tractors, which made it possible to increase the maneuverability, average speed, and logging road and highway safety of trailer trucks by decreasing their length. This in turn made it possible to reduce significantly the empty run time of the trailer trucks in general, and as a result, to increase their productivity and decrease hauling costs.

For the first time in the country designers have created and a plant has started production of a three-axle 6 x 2 type vehicle that has a mechanism for raising the third, non-drive axle when the vehicle is being operated without a load, and for increasing when necessary the full mass of the loaded vehicle. The vehicle's net weight was increased by only 2 tons over that of the two-axle vehicle, while the carrying capacity almost doubled. The rear suspension of the vehicle is also original; two patents have been issued for its design.

In March 1977 the Bureau of the CPB Central Committee, having reviewed the work done by the party organizations at the Minsk Motor Vehicle Plant, the Belorussian Polytechnical Institute, and the BSSR Academy of Sciences on strengthening ties between science and production, praised the creation of the academic department as an effective means of bringing science and production closer together, accelerating scientific and technical progress, and raising the level of training for engineering and scientific personnel. The Bureau recommended that the party organizations develop a comprehensive program for participating in the resolution of the scientific and technical problem of creating a standardized motor vehicle transport system for large-capacity and extra large-capacity trucks; the Bureau called for the participation of institutes of the BSSR Academy of Sciences, industrial scientific research

institutes, departments in higher education institutions, laboratories, and the plant sector of science.

The academic department, together with institutes of the BSSR Academy of Sciences, developed a republic-wide comprehensive program through 1985 for creating a system of standardized large-capacity and extra large-capacity vehicles that correspond to the latest achievements in world motor vehicle production.

It includes a theoretical plan for further development of motor vehicle design and foundations for planning that are applicable for both large-capacity and extra large-capacity motor vehicles. There is also a practical plan for creating and incorporating into production a series of highway vehicles and trailer trucks for international and inter-city hauling (with carrying capacities up to 35 tons); off-the-road dump trucks and trailer trucks for transporting road-bed material and rock (with carrying capacities between 8 and 250 tons); specialized vehicles and trailer trucks, including self-propelled scrapers and trailer dump trucks for working in underground conditions, and a machine for applying mineral fertilizers to soil, the productivity of which exceeds that of the machinery being used at present by a factor of almost 6.

The organizational plan for the academic department's operations and the administration of the chief designer of the "BelavtoMAZ" Association allows for a more complete realization of the program-goal principles in planning scientific and technical progress; it makes it possible to guarantee not only the most rapid incorporation into production of finished scientific developments, but also to plan for future fundamental and applied research directed at resolving the most important problems in developing and improving designs for large-capacity vehicles and trailer trucks. This is especially important.

Fulfilling a huge complex of important experimental, design, and scientific research operations will make it possible for the association's plants to make the transition from creation and incorporation of separate models of trucks and trailer trucks to the production and mass application in the national economy of a highly efficient system of vehicles on the basis of rational series of standardized assemblies and units; this will make it possible to save manpower resources and over 1 billion rubles.

Practical experience called for expanding the limits of cooperation. In May 1979 a scientific production association was formed on the basis of volunteers; it is called "Avtofiztekhn" and includes "Institutes of the BSSR Academy of Sciences with a technical, physics, and mathematics orientation and enterprises of the 'BelavtoMAZ' Association".

The structure, basic directions, and legal forms of the voluntary alliance between science and production are regulated by a special provision. The primary goal of "Avtofiztekhn" is the expansion and strengthening of ties between institutions of the BSSR Academy of Sciences and plants. Its practical activities are based on creative cooperation and economic agreements.

Joint operations are controlled by a scientific and technical coordinating council chaired by Academician N. A. Borisevich, president of the BSSR Academy of Sciences; and M. F. Lavrinovich, general director of the "BelavtoMAZ" Association. The council is made up of leading scientists from the Academy's institutes, chief specialists from the association, and party organization secretaries.

In 1981 some specialized sections were created within "Avtofiztekhn": a design section; a technological section; a social-political section; and an economic section.

All the association's operations are carried out in accordance with the long-range plan for the 11th Five-Year Plan and the annual plans that are developed on the basis of the long-range plan. The five-year plan contains 18 consolidated scientific and technical problems with a design and technological orientation. Among these are problems included in republic and national programs involving the most important issues in technical and natural sciences. The five-year plan for "Avtofiztekhn" is essentially a special comprehensive program that focuses research on problems involving the creation and improvement of machinery produced by the "BelavtoMAZ" Association.

Special attention is given to questions involving the improvement of technology. In particular, technological processes using laser techniques are being developed; at the Minsk Motor Vehicle Plant and the Belorussian Motor Vehicle Plant there are plans to create laser processing sectors. This work is being done by the Physics Institute and the Physical Technical Institute, in cooperation with plant specialists.

Designers from the Minsk Motor Vehicle Plant, in collaboration with scientists from the Problems of Machinery Reliability and Durability Institute, developed the methods and bench equipment for accelerated testing of load-bearing vehicle systems; this made it possible to increase the testing by a factor of 30-50 and it provided an annual saving of more than 200,000 rubles. Work is now being done on new equipment, including hydro-pulsation devices that are controlled by computer. The Mathematics Institute is developing a system for making automated calculations of trucks and trailer trucks; the system will make it possible to select in a minimal amount of time the optimal parameters for the vehicles being designed and for their components.

The Technical Cybernetics Institute and the association's main plant are carrying out joint work on the automation of testing under contemporary production conditions; this is one of the primary means for working out final specifications and conducting research operations within a short period of time and at a high scientific and technical level. One of the complexes of the automated planning system is already in use. With the active assistance of scientists from the BSSR Academy of Sciences, the plant's designers and manufacturing engineers are saving the country over 6 million rubles per year.

A final result of the cooperation among engineers, designers, and scientists was a significant acceleration in the development and implementation of series production of motor vehicles in the MAZ-5335 series, and an increase in the

running time of the vehicles with no major repairs, up to 320,000 km. This represents a saving of hundreds of millions of rubles in the national economy.

Pressing problems that arise in production and that require the participation of scientists are sent directly to "Avtofiztekhn". The Belorussian Motor Vehicle Plant, for example, needed assistance in improving the reliability of its quarry dump trucks with a carrying capacity of 75 tons and over. A working group, which included leading designers and institute representatives, considered this problem at an expanded meeting. The institute representatives made trips to the plant; the next meeting of the coordinating council developed and considered proposals directed at resolving the problem. As a result, 13 important additional goals were included in the republic's comprehensive program. Economic agreements have already been concluded and work has already begun on a number of these issues.

The primary long-range goals of "Avtofiztekhn" are the development and realization of perfected designs and manufacturing processes, and providing a high level of motor vehicle technology in the future. Special attention will be given to research directed at reducing the mass of motor vehicles and at saving materials, fuel, and power; attention will also be given to developing the scientific foundations and means for automated control systems, including microcomputers, that provide over-all improvements in the operational qualities of the vehicle.

In June of last year scientists from the Physical Technical Institute and the Mathematics Institute, and specialists from the "BelavtoMAZ" Association, together with the "Belsemkartofel'" [Belorussian Seed Potato] Association, issued an appeal to scientists and associates in higher education, to workers, kolkhoz workers, and specialists in the republic's national economy, to speed up the incorporation of research results into the national economy and to seek new opportunities for utilizing the achievements of scientific and technical progress. This appeal was approved by the CPB Central Committee. A form of cooperation such as "Avtofiztekhn" opens up broad opportunities for solving the tasks set by the 26th CPSU Congress in the area of scientific and technical progress.

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## MOTOR VEHICLES AND HIGHWAYS

### COMPLETION OF HIGHWAY TUNNEL LINK TO LENINGRAD'S KANONERSKIY ISLAND

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 5 Aug 83 p 1

[Article by V. Ponomarev, correspondent for SOTSIALISTICHESKAYA INDUSTRIYA: "Underwater Highway"]

[Text] Brigadier A. Kalachev, pointing to a huge ocean liner, asked me completely seriously: "Do you want to take a dive under the ship? Well then let's go."

...The asphalt ribbon vanished into the deep, into the concrete coolness of the underground tunnel. The strong vault and walls in the bright light of neon lamps looked imposing and solid. It's hard to believe that above our heads hangs a steel structure, just massive, weighing many tons. Another minute and the sky is once again overhead, the clouds and the sun.

"Now it just takes a minute", says a broadly smiling Kalachev, "whereas before you wasted a whole hour making the round trip by boat."

Construction of the underwater passage, proposed in plans for the economic and social development of Leningrad, brought forth a whole torrent of passions. The "pure" bridge builders supported their "baby"--since they know how to build bridges in Leningrad. Their opponents, proponents of a tunnel, countered with a strong argument: a bridge will become an obstacle to large-scale sea transport, so wouldn't a tunnel be better?

The truth came out in the debate. Specialists from the Lenmetrogiprotrans Institute and from the special design bureau of Glavmostostroy decided to build the underwater highway with a new method, one never tried before in our country.

"Our tunnel is prefabricated", explained O. Ashurov, the chief engineer of bridge gang no. 11 of the Mostostroy-6 Trust. "The hermetic sections of reinforced concrete were assembled on shore in a dry sluice dock; one after the other they were towed out across the water to a predetermined foundation ditch which passed deeply beneath the sea channel. The sections were then submerged in order, each one on its exact location. After being placed on the bottom they were joined together. Tunnel assembly was then completed."



The tunnel builders had much preliminary work to do. Such work in the dry sluice dock involved a careful inspection of each seam for strength. The deep submersion of the sections means that the hermetical sealing is critical.

"But another early step was to get out to the water", these the words of V. Dmitriyev, brigadier of concrete workers, clarifying the history of the project. "A box is not a boat, and a slip here is useless. It was decided to flood the sluice dock and in such a manner force the sections to float. And every one was anxious at the first launching into the water: will it float or stay on the bottom? The towing operation was successful."

The treacherous river can also spring forth another surprise. Some 250 times since the day of its founding the city on the Neva has been hit by floods. Only the larger ones are considered true "tests". While these huge sections were being moved, the slightest shift in the level of the river could have been significant. The slightest rise in the river could have ruined the final stage of the operation, the submerging of the sections and their positioning.

The positioning of the connecting compartments was carried out with a laser. With jewel precision, an underwater pilot sought out the necessary reference points through steel baffles. And then the tunnel pushed out on to Kanonerskiy Island. Years of difficult work were behind. A unique underwater street, one meant for cars and pedestrians, was finished.

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## MOTOR VEHICLES AND HIGHWAYS

### IMPROVED INTERNAL COMBUSTION ENGINES URGED

Moscow EKONOMICHESKAYA GAZETA in Russian No 31, Jul 83 p 2

[Review prepared by the Administration of Machine building of the USSR State Committee for Science and Technology: "Engine to Save Fuel"]

[Text] Internal combustion engines are components of the country's energy base. They are the principal source of mobile energy in agriculture and forestry, motor transport, construction and highway work, water and most of rail transport. They are most important in mobile power.

Information on the basis of much research shows that piston and mixed-type internal combustion engines will continue to be an important source of energy for traditional users in the near future. These engines determine and will continue to determine the technical-economic level of those machines that use them: productivity, efficiency, reliability, cost of use and technical service, ecological characteristics and measurements of ergometry.

Further development of the internal combustion engine is important because of great potential for using non-petroleum based fuel--hydrogen and organic gases, synthetic liquid fuels produced from coal and plant matter, fine coal dust and its colloid.

It is well known that reducing the consumption of fuel in all of the country's internal combustion engines now in use by one and one-half grams per kilowatt-hour of power would mean a saving of more than one million tons of fuel.

Improved efficiency of the internal combustion engine is at present made more complex because of the tighter toxic standards for gases that are released, and in the future because of the inevitable deterioration in quality of motor fuel as poorer quality oil is used. All of these considerations are to be found in the scientific-technical program: "Setting Up and Perfecting the Production of New Types of Internal Combustion Engines With Greater Fuel Efficiency and Increased Power Capabilities."

The program is to eliminate a group of serious shortcomings inherent in the engines; these shortcomings were pointed out at the end of the 10th Five-Year Plan.

## IMPROVED EFFICIENCY

The attainment of improved efficiency and increased potential of internal combustion engines is proceeding in accord with the program along several paths. The main ones deal with perfecting the combustion cycle in the cylinder and reducing heat losses. Heat-retaining coverings will be used more extensively, these on the outer surface of parts forming the combustion chamber.

Usually 30 percent or more of the heat from the fuel is given off to the cooling environment, while an equal amount is given off with the escaping gases. This then calls for the development of an adiabatic engine, that is, one without a heat transfer to the surrounding atmosphere through the cooling system but with a more efficient use of the energy of released gases. Estimates and initial experiments show that the efficiency of an adiabatic engine is 20-25 percent greater than for a normal engine, and this is equivalent to a 20-25 percent reduction in fuel consumption.

In stationary and in marine installations of powerful diesels, units are now in operation which can utilize the heat from escaping gases and the cooling water.

Widespread use of electronic components in engine construction will play an important role. The use of microprocessors in gasoline engines for maximizing the work of the combustion cycle and shutting off the supply of fuel to the cylinders under light loads will reduce fuel consumption in cars by 20-25 percent. Microprocessor control of the accumulative system of fuel supply in diesels will reduce this consumption under light loads by 10-15 grams per unit of horsepower and by one-half the total consumption when the engine is idling.

It is important to note that engine efficiency can be attained not only by new designs but also by perfecting those engines that are now produced. Here we have some valuable experience. The Ministry of Heavy and Transport Machine Building [Mintyazhmash] in 1982 improved the fuel structure on some of its diesels, modernized the form of the lateral exterior of the cylinders and the gas-air channels, and reduced the number of compression rings by improving their quality. All of these improvements meant a fuel savings of more than 40,000 tons. Fuel consumption per horsepower-hour (depending on how the engine is connected) on diesels from the Kirov Factory in Tokmak was reduced from 195 to 169-175 grams, on diesels of Dal'diesel from 165 to 158 and from 165 to 155-158 on the two-cycle railroad diesels of the Kolomenskiy Factory association.

Enterprises of the Ministry of Tractor and Agricultural Machine Building [Minsel'khoz mash] also conserved some 500,000 tons of fuel because of improvements in diesel operation.

When we come to the operational sphere, fuel can be saved only by using the available power of internal combustion machines more efficiently and by eliminating losses of fuel in storage. This will be an even greater saving than

that attained by improving the operation and construction of internal combustion engines.

Here we have in mind elimination of the long and continued operation of locomotive diesels while they are idling on sidings, the senseless operation of powerful tractors and trucks for hauling small loads, etc.

#### INSTEAD OF GASOLINE

One important way to reduce fuel consumption is to install diesel engines in the fleet of trucks and buses, the installation of more efficient diesels in place of gasoline ones.

Large-scale use of diesels began in our country in 1947 with the organization of production in Yaroslav. The Yaroslav association "Avtodiesel" produces standardized 6-, 8- and 12-cylinder diesels for trucks and locomotives produced at factories in Minsk, Kremenchug and Mogilev, for the faster BelAZ mining dump trucks with 27- and 40-ton capacities, and also for the K-700 and K-701 tractors. Production of diesel engines for the larger GAZ and ZIL trucks is being set up.

Figures show that the yearly fuel savings resulting from diesel engines as opposed to gasoline engines for the same amount of work would be 19.2 tons in a ZIL-type locomotive and 7.8 tons in a GAZ locomotive. The first 10 years alone of production of ZIL and GAZ trucks would mean a fuel savings of some 108 million tons.

It has been estimated that setting up the production of diesel engines for trucks for reasons of fuel efficiency would demand 4.5 times fewer expenditures than for increased production of an equivalent amount of oil under present conditions. The difference is almost R8 billion.

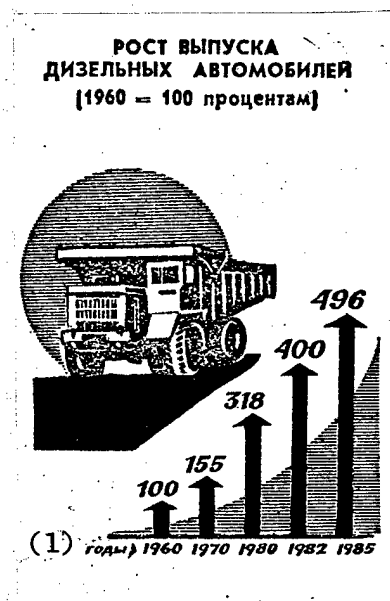
More and more diesel engines are using heavyweight fuels with increased sulfur content (up to five percent) and greater viscosity. This means fuel heats of 100-125° C. Internal combustion engines are now able to operate on low-grade fuels.

At the same time the search continues for efficient substitutes for motor fuel. In the near future this will probably be natural and related gases. There have been developments whereby these gases will be used either in compressed or reduced form. Gaseous fuel will result in a gasoline saving of up to 10 tons per car. We must keep in mind, however, that increasing amounts of gas will also be used in the chemical industry and that the supply, just as for oil, is not renewable.

In the long run, therefore, the greatest interest lies in renewable sources of fuel, especially alcohol-based ones--methanol, ethanol and their by-products. Research work done on engines using alcohol and alcohol-based fuels (up to 15 percent) as part of a program on all types of engines in various climatic zones has indicated a number of problems and possible solutions.

Work proceeds on developing fuels from coal, shale, plant matter and also from coal dust. Scientists envision the possibility of using hydrogen as a source of motor fuel in the future; the hydrogen would come from atomic energy stations and other processes.

# Increase in Production of Diesel-Powered Vehicles (1960 = 100 Percent)



Key:  
1. Year

One of the more positive properties of hydrogen is its wide combustion range in combination with air (15 times greater than for a gasoline-air mixture). This will permit greater control over power output and will greatly increase the efficiency of the internal combustion engine. What we're talking about now is the search for hydrogen compounds that can be used in a motor vehicle; these compounds would, as a function of the engine's operation at that moment, release hydrogen. There are already favorable experimental results.

Many of the goals of the scientific-technical program are associated with the country's Food Program. Work continues on the development of engines that are more powerful, efficient, reliable and useful for tractors and combines in rural areas and for other agricultural machinery.

## WITHOUT ANY DELAY

The Ministry of the Automotive Industry [Minavtoprom] has been most successful in fulfilling the program. Still the organizations under its jurisdiction, the scientific-research institutes and design offices, have not been able to reach planned development levels for electronic systems of operational control in gasoline and diesel engines and power systems. At present their work has not gone beyond the stage of scientific research.

Mintyazhmash, somewhat behind schedule, is now finishing design and production work on a new generation of general-purpose diesels (for water and rail transport) whose use will mean a saving of fuel and lubricants in these sectors. The ministry will also fail to meet the goals set for technical improvements on currently produced diesels and units using these diesels. The reason is that inadequate attention has been given by the ministry's directorship to developing the experimental stations of enterprises and scientific organizations which specialize in the production of the main parts and units for diesels.

Of the diesels produced in Mintyazhmash factories, 70-90 percent of the high-speed models do not have gas-turbine superchargers; these allow for a relatively greater fuel consumption compared with levels attained by the best models of a similar type.

Mintyazhmash (deputy ministers L. Popov and Ye. Matveyev) must concentrate its efforts on the building of turbocompressors: development of new models and quality production of current models. This particular problem is holding up improvements in general-purpose diesels which need such high-compression units made from the most modern materials.

Right from the beginning of the five-year plan the Ministry of Power Machine Building has reduced design and production times for new diesel engines to be used in mining dump trucks with a capacity of 180 tons, and this will mean a considerable savings in fuel and other resources.

Another serious problem is the shortage of high-quality rubber-based parts, instruments and other units--all technologically advanced--especially for use in the north. These shortages occur in the following USSR ministries: Petroleum Refining and Petrochemical Industry, Electrical Equipment Industry, and Instrument Making, Automation Equipment and Control Systems.

All ministries, enterprises, scientific-research institutes and design offices that are making new internal combustion engines and improving currently produced models are urged to immediately propose and carry out specific plans to supply our economic system with efficient, dependable and durable internal combustion engines. Let's keep in mind that complete attainment of the program's goals will mean a 3-5 percent increase in fuel efficiency, a 35-50 percent reduction in the use of lubricants and also a reduction in toxic levels of released gases by a factor of 1.2-1.5. The USSR State Committee for Science and Technology is preparing a more extensive program for the 12th Five-Year Plan.

## MOTOR VEHICLES AND HIGHWAYS

### NEW PAZ-3205 BUS TO REPLACE PAZ-672 MODEL

Moscow AVTOMOBIL'NYY TRANSPORT in Russian No 8, Aug 83 pp 44-47

[Interview with B. K. Kuznetsov, chief designer of the Pavlovo Bus Plant, and V. M. Samartsev, chief of the bureau of artistic design; date and place not specified]

[Text] The participants of the 6th All-Union Congress of Scientific-Technical Societies examined the bus, parked by the Moscow Hotel Rossiya with great interest.



PAZ-3205 Local Bus

The specialists were trying to determine at what plant it had been made, but they could not find a single familiar part. Only the plant logo and a special panel

on the side of the bus near the passenger door indicated that the vehicle had been assembled at the Pavlovo Bus Plant imeni A. A. Zhdanov. The bus was a gift of labor from the automotive workers to the forum of production innovators.

The PAZ-3205 is a new base-model local bus designed to serve the population on routes between the city and the countryside. It will be produced instead of the well-known PAZ-672 bus.

The new bus has an original body. Despite its rectangular shape it does not produce a cumbersome, immobile impression. The designers were able to achieve this by using large front, side, and rear windows. The sub-window line of the body of the PAZ-3205 is somewhat lower than on the PAZ-672 model.

The bumpers with their broad black rubber inserts are capable of absorbing part of the energy of the blow in a collision, which means they will mitigate the results of an accident. The bus' external lights are sunken into the front and rear panels of the body, which protects them against accidental damage.

That is the first outward impression one receives from the PAZ-3205 bus. Our correspondent S. N. Pedenko asked chief designer of the Pavlovo Bus Plant B. K. Kuznetsov and chief of the bureau of artistic design V. N. Samartsev to present the new bus in greater detail.

[Question] The first thing about the PAZ-3205 which attracts attention is its outward appearance. What requirements guided the designers when they were working on the new body, and why does the PAZ-3205 have one passenger door?

[V. Samartsev] The PAZ-3205 was designed in conformity with current State Standards and sectorial technical-production documents with due regard for the requirements of ergonomics and traffic safety and the norms that exist in the CEMA countries.

The bus will be used on local routes. This means that it will work not only on paved roads, but on unpaved ones, and carry passengers significant distances. To meet these requirements we tried to enlarge the angles of the front and rear overhangs of the bus under full load compared with the PAZ-672. The front angle for the PAZ-3205 is 25 degrees (for the PAZ-672 it is 24 degrees), and the rear angle is 18 degrees (14 degrees for the PAZ-672). Moreover, the rear overhang of the body is almost 300 millimeters shorter than on the PAZ-672. These decisions made it possible to improve the new bus's ability to handle rough roads.



We were also concerned about passenger comfort. We developed new soft seats with broad cushions and baggage racks above them and improved visibility from inside. The seating arrangement is four abreast with an aisle 500 millimeters wide.

The use of one passenger door made it possible to increase the number of places for seats while reducing the length of the bus by 150 millimeters. This is the usual arrangement for local buses.

The PAZ-3205 is the base model on which production of a series of buses for different purposes is planned. One modification of it is a suburban bus with two passenger doors.

[Question] Could you please tell us about the new series of buses with all its modifications?

[V. Samartsev] There will be 13 basic modifications in the new bus series. This includes the express, excursion, medical, mountain, and school buses, the commercial bus chassis, and others. After studying the everyday life of rural working people and considering their desires we are also working on a combined freight-passenger bus where the back part of the compartment will be for freight.

Some of these modifications will be produced on the basis of the PAZ-3206 with a 4 x 4 wheel formula.

[Question] The Pavovlovo buses now being produced are based on the GAZ-53A truck. Was this principle preserved in development of the PAZ-3205 bus?

[B. Kuznetsov] This principle was not only preserved, it was one of the main ones because our bus will be used primarily in rural areas, and the most common truck in agriculture is the GAZ-53A.

It has always been convenient and advantageous for enterprises that use different types of motor vehicles to have a standard set of spare parts for them. Therefore, the engine, drive train units, and other assemblies of the new bus are standardized as much as possible with the GAZ-53A. This was one of the principal objectives of the designers.

[Question] What kind of engine is installed in the PAZ-3205?

[B. Kuznetsov] The bus has a ZMZ-672-11 carburetor engine. It is a modernized model of the ZMZ-672 with 120 horsepower. It has a closed crankcase ventilation system and uses 5-7 percent less fuel than the base model. The starting features of the new engine have been improved and we were able to reduce the level of radio interference and toxicity of exhaust gases. The service life of the ZMZ-672-11 engine is 250,000 kilometers (the comparable figure for the ZMZ-672 is 180,000 kilometers).

In addition to a new engine the PAZ-3205 will have a modernized, durable version of the GAZ-53 transmission.

[Question] Tell us about other special design features of the new bus.

[B. Kuznetsov] The front axle of the PAZ-3205 has remained largely the same as in the PAZ-672. The only difference is that we used the girder from the PAZ-672G mountain bus, which has the springs located closer to the longitudinal axis of the vehicle. As a result the new bus' minimum turning ratio is 7.6-8 meters (compared to 9.5 meters for the PAZ-672).

In addition to the two traditional polyurethane springs and two hydraulic shock absorbers four adjusting springs are used in the rear suspension of the PAZ-3205.

The ventilation system for the passenger compartment is a natural one with intake and exhaust through vents in the side windows, three hatches in the roof, and escape holes in the rear posts. The driver's work position has an air intake set above the windshield. The design of its screen prevents moisture from getting into the bus. The intake has a cover that can be shut by the driver.

The bus has a controlled air heating system that works off the engine cooling system. It can heat the passenger compartment where the seats are located to +10 degrees at a height of 100 millimeters off the floor when the temperature of the outside air is -15 to -25 degrees C.

The heating system is practically the same as the earlier design. But it is warmer in the passenger compartment. We were able to accomplish this by using new, very effective and durable weather stripping around the windows and doors.

We should note that the new bus has a two-piece door instead of a four-piece one like the PAZ-672. At the same time the door opening is somewhat larger, 700 millimeters.

One more detail is the use of superposed hinges instead of piano hinges. This made it possible to improve the weather stripping of the door pieces. Incidentally, in the PAZ-3205 the closed door piece sets against the main post of the body, which also improves the quality of the seal.

[Question] You have not said anything about the bus' brake system.

[B. Juznetsov] That is a special subject.

While working on the new bus designers did a great deal on its active and passive safety. They devoted paramount attention to the brake system in this.

The working brake system of the PAZ-3205 is a two-stage system. The main brake cylinder has two chambers. Its front chamber operates the brakes of the front wheels and the back one is for the rear wheels. The system has hydraulic drive with a pneumatic amplifier that works off a two-cylinder compressor.

The PAZ-3205 bus has drum brakes. The rear ones are standardized with the GAZ-53A vehicle, while the front ones are a new, original design with automatic adjustment of the clearance between the drum and the brake linings.

The brake system has a braking force regulator that distributes braking force to the rear wheels.

The driver watches air pressure in the receivers on a double-indicator pressure gage. If pressure drops the driver receives an aural signal and a warning light goes on on the instrument panel. Another warning light switches on when there are malfunctions in the hydraulic drive, and still another one indicates that the working brake system is engaged.

A reliable brake system increases the active safety of the bus. To improve passive safety the PAZ-3205 has energy-absorbing bumpers, an accident-safe steering column, and a steering wheel and instrument panel covered with soft polyurethane foam. The front passenger seats and driver's seat have safety belts. The seats have energy-absorbing armrests covered with polyurethane foam.

The design of the seats will withstand a load 20 times its own weight, and the upper part of the body will withstand an evenly distributed load on the roof equal to the maximum allowable weight of the bus.

The windshield glass is multilayered. If it breaks it will not produce injury-causing fragments. For the same reason we decided to replace the layered plastic that is widely used today for the interior finishing of the passenger compartments of buses with panel board coated with polychlorvinyl film. This material proved quite strong, practical, and hygienic.

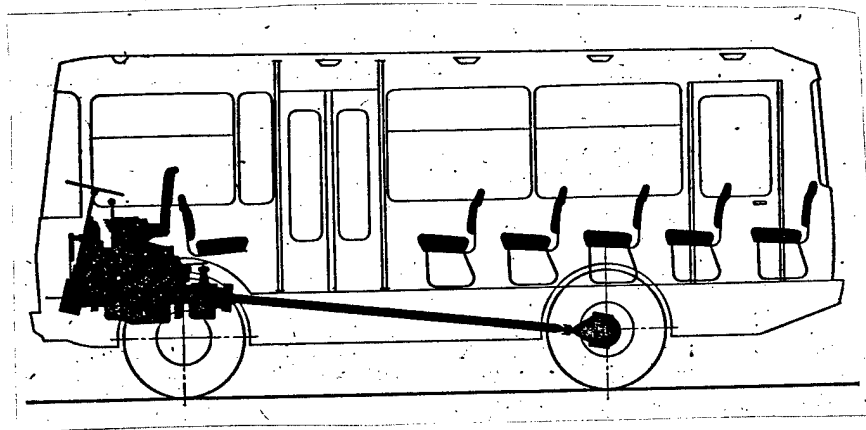


Diagram of the PAZ-3205 Bus

For passenger evacuation the door of the bus has a reversing device that makes it possible to open the door from the outside as well as the inside. For emergency exits it is also possible to use one of the roof hatches, two side windows, and a special rear door. They can also be opened from inside or outside.

[Question] Motor vehicle transportation workers familiarizing themselves with new vehicles are always interested in reliability and durability. What is the service life of the most important units and assemblies of the PAZ-3205?

[B. Kuznetsov] Increasing the service life of the bus is an important job on which designers are constantly working, for this is one of the reserves for increasing the work productivity of motor vehicle transportation. So the body of the PAZ-3205 is designed for 370,000 kilometers before capital repair; the body of the PAZ-672 lasts 330,000 kilometers, while the service lives of the transmission and rear axle are 250,000 kilometers (compared to 140,000), and the figure for the front axle is 250,000 (compared to 70,000-80,000 kilometers).

The PAZ- 3205 will have a steering mechanism from the MAZ-5336 vehicle whose service life is 300,000 kilometers.

In addition to these units and parts which were standardized with other vehicles the design of the PAZ-3205 uses hydraulic shock absorbers and a driver's seat from KamAZ trucks.

[Question] Any new vehicle goes through thorough testing. Is the PAZ-3205 convenient to service? How were the test models of this bus evaluated?

[B. Kuznetsov] The drivers who tested the new bus liked it. The tests showed that the parameters of the PAZ-3205 match the best similar foreign buses; for specific load capacity, specific clearance area, and specific engine power they are even better.

As for service convenience, the new bus has fewer lubricating points in the steering system and more convenient servicing for the brakes and engine cooling system.

It is easier to clean up the passenger compartment because the flooring goes up 180 millimeters on the sides of the body and the cushions of the passenger seats, which are secured by catches, can be removed and installed easily by one person.

[Question] So, the new bus has received the go-ahead. Time will tell how it turns out. But already today it is clear that the Pavlovo automotive workers tried to consider all the requirements of the users in this new model.

# Technical Specifications of the PAZ-3205 Local Bus

| Indicators   | Number of Passenger Doors |       |
|--|---------------------------|-------|
|  | 1                         | 2     |
| Number of Places for Sitting   | 28                        | 24    |
| Rated Capacity, persons  | 36                        | 35    |
| Dimensions, millimeters:   |                           |       |
| Length   | 7,000                     |       |
| Width  | 2,450                     |       |
| Height   | 3,050                     |       |
| Base, millimeters  | 3,600                     |       |
| Wheel Gage, millimeters  |                           |       |
| Front  | 1,325                     |       |
| Rear   | 2,075                     |       |
| Height of Footboard from Road Level<br>(Unloaded), millimeters, not more than: |                           |       |
| Front  | 375                       | 375   |
| Rear   | -                         | 390   |
| Width of Door Openings, millimeters  | 700                       | 700   |
| Usable Area of Passenger Compartment,<br>square meters                         | 11.83                     | 11.45 |
| Area for Seated Passengers, square meters                                      | 9.75                      | 8.66  |
| Height of Aisle, millimeters   | 1,950                     |       |
| Width of Aisle, millimeters  | 500                       |       |
| Weight of Bus, kilograms:  |                           |       |
| Bus Proper   | 4,585                     | 4,545 |
| With Equipment   | 4,830                     | 4,790 |
| With Rated Load  | 7,420                     | 7,310 |
| Angle of Overhang of Body with Rated<br>Load, degrees:                         |                           |       |
| Front  | 25                        |       |
| Rear   | 18                        |       |
| Road Clearance, millimeters  | 260                       |       |

| Indicators   | Number of Passenger Doors |  |
|--|---------------------------|--|
|  | 1                         | 2  |
| Minimum Turning Radius, meters   |                           | 7.6-8  |
| Maximum Speed, km/hr   |                           | 80   |
| Maximum Grade Bus Can Climb at Set<br>Speed on Dry Asphalt Road in Low<br>Gear, percentage |                           | 20   |
| Brake Path on Level Dry Highway with<br>Rated Load at Speed of 60 Km/Hr,<br>meters         |                           | 32.1   |
| Fuel Tank Capacity, liters   |                           | 105  |
| Approximate Fuel Consumption (Liters/100 Km)<br>at Speed of:                               |                           |  |
| 40 Km/Hr   |                           | 17   |
| 60 Km/Hr   |                           | 20.1   |
| 80 Km/Hr   |                           | 23.9   |
| Range for Controlled Fuel Consumption, Km  |                           | 475  |
| Engine:  |                           |  |
| Maximum Power, horsepower  |                           | 120 at 3,200-3,400 min <sup>-1</sup>                       |
| Maximum Torque, kg·m   |                           | 29 at 2,00-2,500 min <sup>-1</sup>                         |
| Ignition System  |                           | Transistor, contactless                                    |
| Clutch   |                           | Single-Disc, dry   |
| Outside Diameter of Drive Disc, millimeters  |                           | 300  |
| Clutch Drive   |                           | Hydraulic  |
| Transmission   |                           | Mechanical with Synchron-<br>izers in 3rd and 4th<br>Gears |
| Gear Ratios:   |                           |  |
| First  |                           | 6.55   |
| Second   |                           | 3.09   |
| Third  |                           | 1.71   |
| Fourth   |                           | 1.0  |
| Reverse  |                           | 7.77   |

| Indicators                                       | Number of Passenger Doors   |   |
|--|---|---|
|  | 1   | 2 |
| Gear Ratio of Final Drive                        | 6.83  |   |
| Tire Designation                                 | 240-508 R   |   |
| Ply Rating                                       | 10  |   |
| Steering   | MAZ-5336 Steering Mechanism with Hydraulic Amplifier Working on Steering Prop |   |
| Gear Ratio of Steering Mechanism                 | 23.6  |   |
| Outside Diameter of Steering Column, millimeters | 480   |   |
| Door Control Drive                               | Pneumatic   |   |

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## MOTOR VEHICLES AND HIGHWAYS

### NEW ALUMINUM RADIATORS TO BE PRODUCED IN ORENBURG

Leningrad LENINGRADSKAYA PRAVDA in Russian 28 Jun 83 p 2

[Article under the rubric "Science Into Production", by V. Tveritina: "No Machinery Breakdowns"]

[Text] More than 10 of our country's automobile and tractor plants have completed the successful testing of assembled aluminum radiators that were designed at the Leningrad Agricultural Institute [LSKhI]. They differ from those radiators made from a single unit in that their individual parts can easily be changed. The new radiators are made of aluminum instead of copper, tin and lead which are in short supply.

Car enthusiasts and professional drivers, in a word all who have to handle a car each day, know what a miserable job it is to repair radiators. At times it is easier to install a new one. But it is not just the repair that is at issue, but also the traditional production process which needs to be perfected.

"The production of water radiators in our country today is one of the largest users of scarce and precious metals", says Vadim Vasil'yevich Burkov, department chairman at the LSKhI. "In 1982 alone the amount of copper used in this production was 110,000 tons, tin and lead 15,000 tons. Our department was faced with the task of reducing these inputs to a minimum. Realizing just how critical the problem was, we decided to set up a sectorial scientific-research laboratory for aluminum radiators, or ONILAR. Now it can be said that we have not only solved the given problem but have gone even further: we can get by completely without any of the scarce metals."

Behind this assurance on the part of the department chairman lies the persistent and precise work of the entire collective. No one hides the fact that there were failures, searching and doubts. But there were also selflessness and devotion to the job, these the main elements, that which finally settled the issue.

When scientists proposed using aluminum instead of copper, manufacturers were more than cool to this idea. The reason is that, as was originally conceived,



parts of the aluminum radiators, just as for those made of copper, had to be welded together. Let's say, as an example, that the length of binding seams for an average-sized radiator totals one kilometer. Therefore the process would be expensive, complicated and not very efficient. Another solution to the problem must be sought, but what? All sorts of solutions were proposed, but all of them in one way or another repeated the old technology.

The solution came quite unexpectedly. V.V. Burkov suggested that, if the parts could not be welded, why not assemble them? Under the direction of the senior engineer in the production sector, A.A. Tikhonov, experimental models were quickly produced and preliminary tests conducted. Although the results exceeded all expectations, the scientists didn't hurry: they carefully checked all figures and only then offered their idea to car and truck manufacturers. And this time the proposal was accepted.

Specialists calculated that just by using aluminum instead of copper, the cost of one radiator would be reduced by R10. Over the course of a year that figure will reach R5 million in the country.

Many factories in the country ran successful tests on experimental parts of the aluminum radiators. One of them is still discussed at the department. Four cars from the Ulyanovskiy Automobile Plant covered 10,000 km through the sands of the Kara Kum and the mountain passes of the Northern Caucasus. Each car had a radiator that was manufactured at the LSKhI. They passed the test with flying colors. One of these radiators is now displayed in the laboratory of model experimentation as an example of the durability and reliability of the prototype.

The department at present is continuing intensive work to introduce cheaper and more economical radiators into production. Agreements have been reached with the Ulyanovskiy Automobile Plant and the Orenburgskiy association "Radiator". The contract reached with the Kirovskiy Plant is being fulfilled; a new model of an aluminum radiator for large tractors is to be designed.

Students are taking an active part in the work of their teachers. Under the watchful eye of the director of model experimentation, V.I. Veselovskiy, and of the senior engineer, S.D. Afanas'yev, the students are following the progress of the experiments, observing and recording the data from automatic indicators.

"We have undertaken socialist obligations this year to develop by June the basic model for the new radiator. But we were successful in our efforts by the middle of March", says professor V.V. Burkov. "It weighs a mere 22 kg, which is one-third less than a similarly sized radiator. Assembly line work on the radiator takes but one minute. You can already see its superiority."

Turkmen cotton workers have praised the design of Leningrad scientists. It used to be that radiators in cotton harvesters got plugged up with white dust, so much so that each shift had to take a whole hour to clean them. Construction of the new radiators prevents the dust from settling; the oncoming wind

cleans them out. This is what the experience gained on the cotton fields of Turkmenistan has shown.

Next year the Orenburgskiy industrial association "Radiator" will begin production of a line of parts for the assembled aluminum radiators both for the auto and tractor industries. This means a savings to the country of many thousand tons of scarce copper, tin and lead, a reduction in the use of electricity of 17 percent, and a less expensive radiator and radiator repair.

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## MOTOR VEHICLES AND HIGHWAYS

### EFFORTS OF VAZ, AZLK WORKS TO REPAIR, REBUILD AUTO PARTS

Moscow ZA RULEM in Russian No 9, Sep 83 p 5

[Article by correspondent B. Sinel'nikov: "As Good as New"]

[Text] The two leading automotive plants producing light-weight vehicles (VAZ [Volga Auto Plant] and AZLK [Auto Plant imeni Lenin Komsomol], are setting up to restore worn-out parts, components and assemblies of the Zhiguli and Moskvich cars. Our correspondent B. Sinel'nikov has visited both plants and tells us what has already been done and what tasks of great national economic and social importance still remain to be solved in the coming years.

VAZ was the first to start remanufacturing worn-out parts. And since the majority of the personal car fleet in the USSR are Zhigulis, it is VAZ which will have to carry out the larger part of the industrial-scale overhaul plan which has been outlined for the next few years.

"We will build four plants to remanufacture engines and major auto assemblies," says R. Kislyuk, deputy general manager of VAZ. "Two of these plants will be in operation in 1985. The others will come on line in 1987. However, without waiting for the completion of these major facilities, some of our SATs [Special Auto Centers] have already started to rebuild parts and components, using the technology which has been developed. Special shops and departments are being organized in several of the major enterprises of AutoVAZtekhobsluzhivaniye [VAZ Auto Technical Service] to perform this work.

Each Zhiguli owner is naturally interested in the condition of the engine, transmission, rear-axle reduction gear and the other accessories, components and parts after factory overhaul. These parts will meet specifications that do not differ significantly from those of new parts. The parts will even be difficult to distinguish on the basis of external appearance. Most important of all: the rebuilt assemblies will have the same service life as new units.

Judge for yourself. After overhaul each part will have the same characteristics as a new part, since it will go through the same finishing operations. The only difference will be in the starting blank, which will have practically no effect on the quality. Naturally, during assembly of the units new parts will be used to replace those which are not suitable for restoration. Such parts include all the gaskets, rubber goods, bearings, fasteners and so on. Each finished unit receives a certificate of compliance after the tests."

It becomes clear from the deputy general manager's story that the plant is going to have to master a new undertaking of large scope. The plant will of course be assisted by its associate plants, forming part of the AvtoVAZ Association, and by other enterprises. A. Yevstigneyev, deputy manager of AutoVAZtekhobsluzhivaniye, enters the conversation:

"The production of remanufactured assemblies--there is no other suitable term for work of this scale--will be based on advanced industrial-scale methods. We are studying the experience of foreign firms, with one of which we will collaborate in the construction of the first overhaul plant in Zhigulevsk. Here there will be specialized equipment, materials and technology. Our objective is to overhaul in 1987 in the plants being constructed 400,000 engines and hundreds of thousands of other assemblies, components and parts, which will be as good as new.

Moreover, next year alone our SATs are scheduled to repair 50,000 engines, and this number will rise to 140,000 engines a year by 1987. At the same time we will produce rebuilt parts and components of twenty three different types.

Our associate plants will also be involved in this work. For example, carburetors and fuel pumps will be rebuilt in Dimitrovgrad, and the plants which fabricate electrical instruments are working out the technology for overhauling starters, generators and distributors. Departments in some of the SATs will also work under their guidance."

We are aware that rebuilding of the most scarce part (the distributor shaft) was initiated at VAZ last year. Can we take a closer look at how this is done and examine the finished shafts after rebuilding? Along with Yevstigneyev we visited the AutoVAZtekhobsluzhivaniya Garage Equipment Plant, where a specialized production line is in operation.

The worn shafts arrive from the service stations for incoming inspection and are cleaned in tanks and dried. The plugs are removed from the shafts and the concentricity is re-established on a lathe. Then the cams are profiled on a grinding machine and checked against a template to locate any worn places which must be plated with steel. This operation is performed on semiautomatic welding machines in a CO<sub>2</sub> gas atmosphere. The internal stresses arising from intense local heating are relieved by annealing the shaft in a furnace. The rest of the procedure is the same as that used in the fabrication of new parts

in the basic production process. The finished shaft looks like a new unit, except for the special marking. Of a hundred units entering the plant for restoration, 80-85 will be rebuilt. The others are discarded during incoming inspection or during processing.

Valve rocker arms are restored here very simply and in an interesting way. They are straightened in a fixture on a press and are then ground and nitrided. As a result all the working surfaces have the required dimensions and hardness. If we further note that nearly a hundred rocker arms are processed simultaneously on the machine, we can see that this method is highly effective.

Kislyuk says: "It is obvious that the technology which we select for restoration of the parts must be highly effective. Otherwise we cannot satisfy the ever-increasing requirements for the overhaul of vehicles. But here is a curious factor: to date we are having a problem finding a common language with the motorists. These are the same auto owners who are primarily interested in obtaining assistance from us in repairing their malfunctioning vehicles. Many of the owners do not want to turn in (or rather sell) to the service station or the special auto center the worn-out shaft, half axle or other parts after replacing them with new parts. How are we to create a stock of units for overhaul, what are we to "feed" the production line with?"

I recall letters from readers in which they complain to the editors about the STO [Technical Servicing Station] requirement that they turn in their old parts. The readers' conclusion is usually the same--they may need the part. This attitude is the natural result of the unfortunate situation in which the motorist, in view of the current shortage, is afraid of losing his only chance (even though questionable) of repairing the part locally. When a need arises the part may not be available. Experience shows that such suppositions are not realistic. A normal replacement is made and the worn-out "iron" first clutters up the garage, and then is simply thrown away. This is obviously not economical. And the money paid for the old parts is not negligible. The plant will pay 30 percent of the new-part price for the old part. However in this regard we should also blame the auto service agency--the requirement for turning in the replaced part or component is not always linked to the obligation for fair and scrupulous dealing with the motorist on the basis of the current price list. How will the overhauled parts be sold back to the motorists?

Kislyuk responds: "The price of the overhauled components and assemblies at which they will be sold to individuals is 70 percent of the new-part price. Thus, when the motorist turns in an old part he obtains a fully reliable assembly or component which has been rebuilt at the plant, paying in the final analysis only 40 percent of the price of a new unit. Moreover the unit will have a guarantee, which is twelve months for an engine, for example. Isn't this a good deal?

I would like to use this magazine to urge the motorists to be more active in turning in worn-out parts, assemblies and components, lists of which with their purchase price are posted in our SATs and STO. Obviously the enterprises cannot buy back units which are not suitable for restoration because of mechanical damage or excessive wear. I hope that we both producers and users, will find a common language and mutual benefit."

Returning from Togliatti, I visited the Moscow plant of AZLK. Things are going forward here as well.

V. Peschanov, deputy general manager, said: "We are building a plant in the city of Valuyki in the Belgorod Oblast to overhaul Moskvich components and accessories. The technology and the equipment have been developed. Our SATs in Moscow, Kiev, Minsk and some other cities have started to rebuild several parts and components.

At the AZLK branch in Kineshma a large shop is already in operation, the program of which includes overhaul of the components of the front suspension and the braking system. In addition to the machined parts, we are planning to repair panel-type parts--front fenders and hoods--which are in short supply. For example, the fender is broken down into seven segments, for the replacement of each of which a unique "patch" is stamped. The damaged segment of the fender is cut out and the new segment is welded in its place. After finishing, the fender looks as good as new.

We are facing the same problems as VAZ, one of the primary problems being the creation of a stock of parts for overhaul. We assume that once the motorists become convinced of the high quality of the restored parts they will turn in their worn-out parts without any regrets.

We are going to have to resolve the question of the enterprises operating the Moskvich vehicles. These enterprises absorb a large percentage of the spare parts but are not obligated to turn in the worn-out parts. And no appraisals are available for these parts. We hope that Gosplan and Goskomtsen [State Committee for Pricing] will be able to establish some order in this matter."

After becoming familiar with the progress in fulfilling the tasks associated with the rebuilding of work-out parts, components and accessories, you can see that in the near future the motorists will be able to use inexpensive but fully reliable parts when overhauling their vehicles.

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## MOTOR VEHICLES AND HIGHWAYS

### BRIEFS

**TWO-MILLIONTH DIESEL TRACTOR--Barnavl--**The 2-millionth diesel has rolled off the assembly line of the Altay Motor Construction Association. Two-thirds of all the caterpillar plowing tractors are produced with these engines. The Altay steel engines are used on graders, excavators and lift trucks, irrigation pumping stations and hoisting cranes. Their technical and operational characteristics are improving every year, engine service life has increased from 3,000 to 6,000 hours and fuel consumption has decreased significantly. And now the 2-millionth diesel! In a solemn ceremony V. N. Bavarin, secretary of the Party committee of the enterprise, turned the 2-millionth diesel over to Vladimir Kuz'mich Prokurov, holder of the Red Banner of Labor award, socialist competition winner, and team leader of the Pavlovsk State Farm of the Pavlovsk Rayon. [Text] [By N. Il'ichev] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 14 Jun 83 p 1] 9576

**NEW MINIBUS--**The first experimental models of the "Latviya" modernized minibus have been produced at the minibus plant of the Riga Automotive Plant imeni 25th CPSU Congress. Externally, the RAF-22038 minibus differs very little from the machines which are at the present time rolling off the main assembly line of the plant. But anyone who sits behind the wheel of the new minibus immediately sees the advantages of the new vehicle. A fundamentally new front suspension, specially developed for buses of this class, is installed on the modernized minibus. The technical and operational parameters of the engine and of the vehicle as a whole have been improved. The vehicle is more powerful and more economical. The vehicle operating mileage prior to major overhaul has been increased by 25,000 kilometers. The braking, ventilation and interior heating systems and other components have been improved. The driver's cab has been made more comfortable, and the external and internal finish of the Latviya have been improved. The planners and designers of the enterprise have created a minibus that meets the highest requirements of the automotive construction industry. [Text] [Riga SOVETSKAYA LATVIYA in Russian 19 Aug p 4] 9576

**AUTOMAKERS COOPERATE--Sofia--**The 45-thousandth GAZ-53A truck has rolled off the assembly line of the "Madara" Automotive Combine in Shumen. The enterprise team has dedicated this labor triumph to the forthcoming 39th anniversary of the socialist revolution victory in Bulgaria and the 25th anniversary of the enterprise. The Madara Combine is one of the largest machine construction enterprises of the country. The specialists of the Kharkov Tractor Plant took part in its construction. Later, the engineers of the Gorkiy Auto Plant

assisted their Bulgarian colleagues in smoothing out production of the trucks. The continuing cooperation with the automakers of the fraternal nation plays an important role in the fact that the combine has already produced about 850,000 front and rear axles, has started production of the diesel engines which are installed on the Soviet ZIL-130 trucks, and has initiated production of the Bulgarian-designed Madara-1,300 truck. By the end of the 8th [Bulgarian] Five Year Plan the gross output will increase by 1.5 times. The Madara plant will become the primary producer of all versions of the drive axles required by the motor vehicle construction industry of the socialist collaboration nations. [Text] [By V. Babkin, TASS correspondent] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 19 Aug 83 p 3] 9576

NEW REFRIGERATED TRUCKS--Kharkov Oblast--Refrigerated trucks of a new type with the NAST-3 nitrogen cooling system will be able to deliver fresh products to the customer in the hottest weather. The experimental plant of the Physico-Technical Institute of Low Temperatures of the Academy of Sciences of the UkSSR, which developed the new vehicle together with the Vetkhovskiy Experimental Plant of the Ministry of Automotive Transport of the UkSSR, has completed the fabrication of the first group of the specialized trucks. Liquid nitrogen at -196 degrees Celsius is the cooling agent in the new systems; the liquid nitrogen is injected directly into the body of the thermally insulated vehicle, rapidly reduces the temperature to the required level and surrounds the produce with an inert gaseous medium, not only slowing the spoiling processes but also fully protecting biologically valuable substances. Today the new refrigerator trucks are delivering vegetables, fruits, meat and milk to practically all regions of the central Kharkov area. Plans are to supply the eight largest Ukraine oblasts with trucks with the nitrogen refrigerating system during the present Five Year Plan. [Text] [Riga SOVETSKAYA LATVIYA in Russian 7 Sep 83 p 2] 9576

FULFILLING AN INTERNATIONAL OBLIGATION--A large group of Vietnam citizens has arrived at the Volga Auto Plant in Togliatti to obtain practical experience. This is one of the events associated with the Soviet-Vietnam inter-governmental agreement of 1981. Vietnam achieved its victory in the war against the interventionists at a heavy price. Damaged cities and villages, agricultural lands burned with napalm, destroyed enterprises, bridges and roads--such is the legacy of the stay of Americans in Vietnam. Restoration of the national economy required tremendous efforts and highly qualified personnel. One of the forms of aid which the Soviet Union is providing to socialist Vietnam as part of its international obligations is professional training of our Vietnamese comrades, offering them the possibility of obtaining experience in various branches of the national economy. Today you will find Vietnamese emissaries in Krasnodar, Astrakhan, Volgograd, Donetsk, Kursk, Dzhambul, the Kemerovsk Oblast and the Altay Kray. Now the doors to the enterprises of the auto industry in Yaroslavl (Auto Plant) and Togliatti (VAZ) have also opened up for the Vietnamese. [Text] [Moscow ZA RULEM in Russian No 8, Aug 83 p 9] [COPYRIGHT: Za Rulem, 1983] 9576

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## RAIL SYSTEMS

### POSSIBILITIES FOR INCREASED HAULING OF COAL

Moscow ZHELEZNODOROZHNIY TRANSPORT in Russian No 7, Jul 83 pp 27-30

[Article by A. P. Zinov'yev, deputy chief of traffic services, Donetsk Railroad; Yu. Ye. Luk'yanov, candidate of technical sciences; and Yu. L. Masalov, candidate of technical sciences: "Reserves for Increasing Coal Shipments"]

[Text] Railroad workers are faced with some major tasks in terms of increasing the shipment of national economic freight in the 11th Five-Year Plan. Of special importance is the resolution of problems tied to hauling coal. Prompt shipment of the required quantities of coal to industrial enterprises and electric power plants is one of the primary tasks stemming from the decisions of the November (1982) Plenum of the CPSU Central Committee.

#### The Formation and Utilization of Hauling Resources

Recently the network's coal hauling lines have not been consistently successful in providing the necessary fuel shipments. The volume of the coal shipments has varied both on a daily basis and throughout the course of the year due to a number of factors. For example, at the Donetsk Railroad the difference between the maximum and minimum number of occupied coal cars on different days reached 1700.

Throughout the course of a day the coal cars are also loaded irregularly. The proportion of loading done during the last quarter of the day is very high. At the Donetsk Railroad this figure ranges between 50-60 percent and has reached 63 percent. The situation is no better on other coal-hauling railroad lines. We will examine the causes of this irregularity and we will consider how to estimate the losses that result.

Coal cars that are freed up after being unloaded, that arrive according to regulation quotas, that are located at the beginning of the given day at loading points and are waiting to be loaded, and also those that are already in trains on the track are responsible for the shipment of coal and other national economic freight on a daily basis. The hauling resources in all of the railroad's coal-hauling departments are formed the same way.

There is an additional source for forming shipping resources at a number of railroads and departments: the arrival of coal cars from railcar-building

plants located within their borders. All railroads receive coal cars from railcar depots and from railcar repair plants after they have undergone repairs.

The primary source of coal cars for shipping coal and other freight is unloading the cars, and not receiving empty cars. Evidence of this can be seen in the following data: in January at the Donetsk Railroad the average ratio between unloading and loading operations was 0.708; in March and October there was an increase in unloading operations of 10 and 12 percent, respectively, over the January level and the ratios were 0.722 and 0.723. In terms of the daily periods, the coefficients of the variation between unloading and loading were approximately the same: for the first quarter of the day the values were 0.18 and 0.19; for the 6 hour period, the values were 0.14 and 0.15; and for the 12 hour period, the values were 0.73 and 0.74.

Since the level of shipments is determined by the amount of unloading that is done, we should look at the sources that account for the unloading operations. For the coal-hauling lines, and other railroads, part of the unloading work comes from railcars that arrive from other railroads in the network (imports). A significant proportion of the shipping resources come from open railcars that are loaded in the local railroad (hauling "for oneself"). When a large proportion of shipments of all different types of freight are made using coal cars from the local railroad, the specific features of coal-hauling railroads should be noted, such as the large volumes of coal shipments made within the limits of the same railroad line. In the network an average of 60 percent of the fuel is shipped by local lines.

The hauling possibilities created by these sources are utilized directly for shipping or they are rejected because they are unsuitable for shipping purposes; this is due to expiration of repair deadlines or, most often to their commercial or technical condition. Quite a few coal cars that are unsuitable for shipping end up on the coal-hauling railroads. For example, up to 40 percent of the coal cars that are supplied to the Donetsk Railroad according to the regulation quota are in need of current repairs. Other coal-hauling railroads in the network are experiencing a similar situation.

The size of each of the hauling resources fluctuates considerably. For example, the variation coefficient of the carry-over surplus of empty coal cars is 0.13-0.14. This same indicator for unloading is 0.05-0.12; and for loading it is 0.11. The values for total hauling resources also change constantly.

An analysis of accounting data indicates that there is a significant irregularity in the arrival of coal cars and loading operations--which is one of the primary sources for the formation of hauling resources. At the main junction points of the Donetsk Railroad, through which empty coal cars coming from the Lvov, Southwestern, Odessa, and other railroads are transferred, 7-9 percent of the daily regulation quota of incoming railcars arrives during the first quarter of the day and 47-55 percent arrives during the last quarter. The losses that occur as a result are obvious. Experience shows that at the same time this creates conditions for a subjective approach to questions involving organization of shipping operations and even violations of the established statistical reporting.

The changes in the volume of unloading operations, the number of empty open railcars received, and other factors in shipping resources are described by correlation equations. The summed curve depicted in figure 1 corresponds to these equations. The shaded area in figure 1 represents the zone in which there is a deficit of hauling resources. This zone grows larger as the discrepancy between unloading operations and the transfer of empty railcars increases, and as the proportion of unsuitable coal cars rises. The concavity of parabola 2 in relation to line 1 (which corresponds to irregular loading operations) indicates the uneven and irregular nature of coal shipments made over the course of 1 day by stations, departments, and the railroad as a whole.

A decrease in the deficit of hauling resources in different periods during the day and stabilization of loading operations is achieved at coal-hauling railroads by utilizing the operational industrial reserve of coal cars. When a reserve exists the level of hauling resources rises; the point of intersection of lines 1 and 2 shifts to the right; and the shaded area decreases (figure 2). Transferring part of the coal cars from the reserve to the working fleet increases hauling resources, levels out parabola 2, and brings it closer to line 1. As a result, there is more rational utilization of the loading and unloading mechanisms, shunting equipment, and the locomotive fleet. We share the opinion of a number of experts who believe that it is necessary to create a reserve for each railroad, taking into account the characteristic daily irregularities in the formation of hauling resources.

The creation of an operational industrial reserve of coal cars by itself leads to significant expenditures for its maintenance, however. Therefore, implementation of measures directed at increasing the regular delivery of empty coal cars and unloading of cars carrying freight, is the most important condition for ensuring minimum losses due to failures to supply cars for hauling coal.

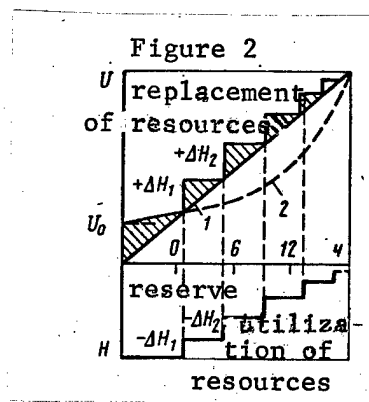
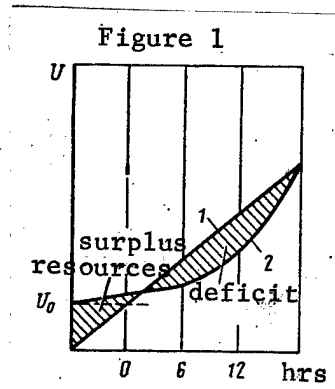


Figure 1. U--railroad's hauling resources, cars; U --number of cars waiting to be loaded at beginning of the day at loading points or in trains in sections. Figure 2. H--reserve of empty railcars;  $\Delta H_1, \Delta H_2$ --portion of the empty car reserve transferred to the working fleet, cars

### Strict Fulfillment of Transfer Plans

In our opinion, a large proportion of local hauling with coal cars on the coal-hauling lines should draw more attention to the turn-around time of the local railcar, and primarily, the local coal cars. The Donetsk mainline is among the railroads with a significant proportion of hauling done locally, that is, the formation of the majority of hauling resources takes place within the

railroad itself. For railroads with a large volume of local operations, the hauling "for oneself" is an important source for obtaining empty rolling stock for coal shipments.

At the same time, shipping in local lines has a substantial effect on the operation of the railroad as a whole. Organization of shipments taking into account prompt unloading and the unloading capabilities of the consignees; regulation of shipping; accelerating the movement of local freight and empty cars for their destination stations; and making changes in the use of locomotives can increase the regularity of the hauling process. A railroad also has the possibility of carrying out a large volume of work using the same fleet of cars. Poor delivery of trains from neighboring railroads will have less of an effect on operations.

An analysis shows that at the Donetsk Railroad, over the last 10-11 years the proportion of hauling done in local service is 49.7-53.5 percent. In the 9th Five-Year Plan the rate of growth in total shipments exceeded the rate of growth of local hauling; beginning in 1976, thanks to increased attention to local hauling as an additional reserve for creating hauling resources, the rates of growth in total shipments and in local hauling were closer. In 1979-1980 the increase in local hauling even exceeded by an insignificant margin (0.5-0.9 percent) the increase in total shipments.

In the last 10 years cars loaded locally have accounted for an average of 68.3 percent of the total unloading operations; in the 9th Five-Year Plan this figure was 69.6 percent and in the 10th Five-Year Plan it was 67 percent. The delivery of cars to be unloaded at the railroad's external junction points increases every year, but during the middle of the period being examined the rate of growth of cars brought in declined markedly. In the following years the arrival of local freight declined. The railroad's own hauling resources declined as a result, and consequently so did its shipments. At the same time there was a decrease in the number of empty cars received by the railroad according to the regulation quota (there was an average annual decrease of 3.5 percent in the number of empty cars).

In order to improve the operation of coal-hauling railroads, it is very important to guarantee delivery of the necessary number of empty coal cars according to the regulation quotas. A failure to meet the quota for delivery of coal cars to a coal-hauling railroad leads to serious consequences, which make it difficult to resolve the primary goal of meeting the national economic demands for fuel.

We will examine how a failure to meet the regulation quota affects fulfillment of the plan for coal hauling. It is generally thought that delivery of a certain number of empty coal cars to a coal-hauling railroad on a given day can be compensated for by increasing the delivery of cars on a subsequent day. The plan quota for delivery of empty coal cars in such a case is considered fulfilled if the final sum of empty coal cars that have been delivered reaches the planned volume.

An analysis shows that a decrease in the transfer of empty coal cars, and of coal cars loaded with local freight, and a failure to fulfill the norm for local

railcar turn-around time, over a sufficiently long period of time affect the formation of hauling resources and is one of the main reasons, if not the main reason for failure to fulfill plan quotas for fuel shipments. Why does this occur? If we suppose that after a period of normal operation, a railroad where the local railcar turn-around time is one day and local service freight accounts for 50 percent of the total, did not receive 1000 empty cars. That means that during the first day, 1000 cars would not be loaded; this would include 500 cars for local service and 500 for external hauling.

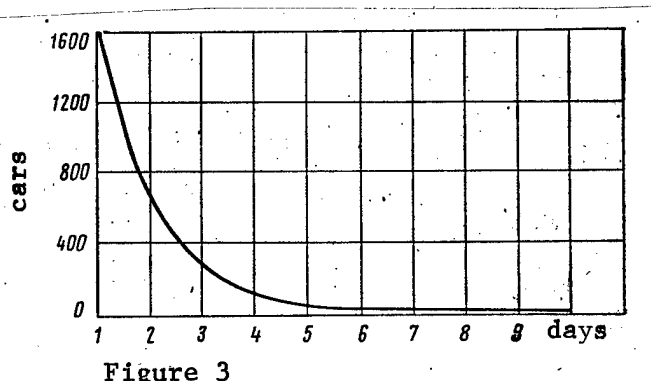
The following day, 500 cars will not be unloaded (those that were not loaded for local service during the first day). Consequently, proceeding from the conditions of the example, 250 of these cars will not be loaded for the railroad's own use. On the third day the loss will be 125 cars; on the fourth day, 63 cars; on the fifth, 32 cars; on the sixth, 16; and only on the eleventh day will there no longer be any effect from the shortage of cars on the first day.

We will call the 500 coal cars that were not loaded for the railroad's own use on the first day the basic loss; and the remaining cars that were not loaded on the following days--250, 125, 63, 32, 16, 8, 4, 2, 1--we will call the additional losses in hauling resources for the coal-hauling railroad. If the railroad fails to receive 500 cars every day for 10 days, then the loss in hauling resources is: basic losses=500·10=5000 cars; and additional losses=250+(125+250)+(63+125+250)+...+(0+1+2+4+8+16+32+63+125+250)=4006 cars; the total losses would be 9006 cars. This is equivalent to a daily loss of hauling resources of 900 cars. As a result, there is a need to provide for delivery of an additional 900 cars per day over the next 10 days in operational plans.

When 1000 cars are not delivered on the first day, followed by delivery of coal cars to the railroad according to the plan quotas, the losses will be 1000 cars; half of them will be distributed over the course of the entire 10 day period. In order to eliminate the debt during the next 10 day period, the railroad needs to deliver 100 more cars per day than stipulated in the plan.

An analysis of various combinations of days with plan delivery and failures to fulfill regulation quotas shows that in any case the losses are easy enough to estimate and it is easy to outline a plan for their elimination.

Generally, the effect of a failure to fulfill the plan for delivery of empty coal cars to a coal-hauling railroad can be estimated by proceeding from the fact that the losses of hauling resources due to delivery failures on subsequent days is calculated as the sum of the diminishing number series (figure 3). This method makes it possible to determine the exact size of the resource losses due to a failure to fulfill the plan for delivery of empty coal



cars, using average values (both basic and additional losses are taken into account). This type of analysis makes it possible to predict the required volume of hauling resources that will provide fulfillment of the railroad's (or department's) monthly technical norms when the delivery of empty coal cars deviates from the regulation quota.

Under the specific conditions of the Donetsk Railroad, when there is a failure to meet the regulation quota of 1609 coal cars per day, the total resource losses can exceed 2750 cars. If under the same conditions the railroad does not receive 1609 cars per day, losses during the period under consideration will be over 25,500 cars. It is clear that compensation for the loading shortfall in this case requires that an additional 2600 cars per day be delivered. This is not an easy task: in the first place, these resources must be sought out in the yards of other railroads; and in the second place, significant difficulties arise in trying to transfer such a large number of cars through junction points.

### The Transfer of Coal Cars

Railroad lines that join major loading regions with consumers of fuel and metallurgical cargo located in different economic regions of the country experience significant overloads in the movement of both loaded and empty cars. In addition to the negative effect on the formation of hauling resources for coal-hauling railroads, there is no guarantee of unhindered passage of trains through inter-railroad junction points, especially during periods preceding the accounting hour; and the train situation in all sectors is complicated.

Empty cars arrive at the junction points very irregularly. An analysis shows that limitations in the traffic capacities of sections and stations, frequent operational corrections in the schedules, and a desire to reduce the size of the car fleet located in the subdivision by the accounting hour, all contribute to the irregularity of traffic that occurs during a one day period. When there is through passage of empty cars "for delivery", with a considerable amount of shunting of loaded cars, there is a sharp decline in the schedule indicators and the work of the sections is more difficult. Up to 45 percent of the rolling stock of the Lvov Railroad is delivered to the Southwestern Railroad during the 13-18 hour period; the Southwestern Railroad times the transfer of empty cars to the Grebenka and Mironovka stations during the 16-18 hour period; the Southern Railroad has the maximum increase in transfers to the Donetsk Railroad at the Osnova-Bukino section also during the 15-18 hour period (45-50 percent of the empty coal cars, compared to the 7-9 percent delivered during the first quarter of the day). This does not provide stable operation for the lines, the coal-hauling railroads, or the branches. Stations have no space to put cars that arrive at a branch in large bunches and there are not enough locomotives to take the loaded cars to other sections. In a number of cases empty cars stand idle waiting to be taken to a section for 3.5-6 hours, or longer.

During the course of a day there are large variations in the speed of at which empty cars move through the lines. On the Karpaty-Donbass line, for example, an analysis of the traffic schedules shows that some "delivery" routes have a route speed of over 75 km/h, while other cars move at a speed of about 20 km/h; 40 percent of the cars move along at a speed close to 40 km/h; and only 20 percent

of the stock on this most important route travel at speeds between 50 and 70 km/h.

Railroads can be guaranteed regular supplies of hauling resources if the traffic schedules establish movement of empty cars with separate numbers, which must be used constantly, regardless of fluctuations in the amount of traffic. These trains should operate on lines with high section and route speeds. It would be advisable to set up these lines with varying section travelling times. All the necessary conditions for this exist: contemporary electric and diesel locomotives can pull a train with a mass of 1000-1200 tons, made up of empty cars, faster than they can pull loaded cars with the usual mass.

Specially selected schedules should be used when dispatching empty cars from "regulation" railroads. Since the majority of coal cars (60-80 percent) will be moved in strict accordance with the schedule, this simplifies control over fulfillment of regulation quotas. The existing system of control that is more complex will be needed only for the remaining cars, which the railroads will deliver according to any schedule and in any type of train, according to the existing formation plan.

Traction calculations for the differentiated running times and experimental schedules show that this method can be used to accelerate the movement of routed empty stock by approximately 0.7-0.8 hours for every 100 km run. This will not require an additional increase in the utilization of traffic capacity. Moving empty stock according to a schedule will provide a reliable technological and structural basis for organizing operational and current planning of utilization; it will increase the delivery of hauling resources to railroads involved in mass shipping of coal, other ores, and important cargo.

The specialized traffic scheduling of a stable portion of empty trains that are in constant circulation should change the approach taken toward them at transit "regulation" railroads. There should be a prohibition against removing these cars from a route for a railroad's own shipping use without permission from the Ministry of Railways and without replacing the cars with equivalent stock. There should also be strict control and analysis of the fulfillment of the traffic schedules for trains of this type.

At mass unloading stations for coal cars, selection of cars suitable for coal-hauling should be organized. From there the stock should be sent, according to transfer invoices, to coal-hauling railroads. There will be simplified control over barring transfer of unrepaired rolling stock to the Don basin and other coal basins.

At entry points of the coal-hauling railroads there should be a control check of empty trains by workers from technical service points and planning and design departments; only after a decision has been made concerning the suitability of the cars should they be sent on for loading or to coal car preparation points that are located in mass loading regions. This shortens the empty run of the cars and frees up stations from additional work on unrepaired empty cars. When coal cars are sent to loading stations, they are considered part of the hauling resources; after their condition has been checked or they have been unloaded and

rejected, the rolling stock is reformed and the cars are sent for repairs to the coal car preparation points, which is often in the opposite direction.

At the Donetsk Railroad a great deal of work is being done to increase regularity in unloading coal cars. A special feature of the railroad is that about 95 percent of the unloading operations are done on spur tracks. For this reason, railroad workers and collectives from enterprises of the ministries of the coal and metallurgical industries, and other departments, are constantly seeking ways to speed up the turnover rate of cars, and to free them up as quickly as possible to carry more coal and other cargo.

Means of communication and computer technology can do a great deal to improve control over plan fulfillment for coal hauling at the railroads; of particular importance is a dialogue-information system for operational control over the loading, which takes into account the specific features of coal-hauling railroads. This will make it possible to have an operational influence on the movement and rational utilization of hauling resources. The question of equipping coal-loading stations with means for transmitting information must also be resolved. At the Donetsk Railroad and at other railroads teletype equipment has been installed at 30-50 percent of the stations. At the rest of the stations installation of this equipment is planned only in 5 years or more.

A careful, economical approach to hauling resources and stabilization of the supply of empty cars to the coal-hauling railroads are the most important factors in increasing the volume of fuel shipped by the railroad lines.

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## RAIL SYSTEMS

### WORK UNDERWAY ON EXTENSIONS OF YEREVAN METRO'S FIRST LINE

#### Gortsaranain-Ploshchad' Spandaryana Extension

Yerevan KOMMUNIST in Russian 9 Aug 83 p 1

[Article by A. Shkulev: "The Pace Is Quickening"]

[Text] After the start-up of the Gortsaranain Station there was a notable increase in the construction and installation work in the tunnel runs on the line between the Gortsaranain--Shengavit--Ploshchad' Spandaryana Stations. The group of No 3 Section of TO [Tunnel Detachment]-25 after a protracted period of idleness due to the lack of reinforced-concrete blocks began to receive them from Charentsavan and began to resume its normal labor pace. Excavation of the tunnel faces is being conducted in unstable rock; therefore, it is necessary to finish off each excavated meter of the tunnel. On the left-hand run of the tunnel 199 linear meters have been excavated, on the right-hand run--186 linear meters, and 400 meters of tunneling remain in each underground excavation. So far the work has been carried out in two shifts. A third shift is being organized.

Construction of the Shengavit Station is being carried out by the open method in a pit with the subsequent filling in of the structure with earth. For the first time the entire station will be covered by a single vault; this will allow operations to be speeded up and will make them considerably less expensive. Around the perimeter of the platform hall work is being finished up on drilling wells for strengthening the earth, after which the excavation of the second tier of the pit will begin, along with the erection of the walls and the vault of the station. In order to speed up the construction of the station, it was planned to build a concrete plant and a reinforcement workshop.

To the left of the Shengavit Station, with an exit onto the ground surface, there will be a branch running out to the metro's car depot. Earthwork has begun on the construction of this branch. It is being carried out by workers of the SMU [Construction and Installation Administration]-160 track section.

Round-the-clock sinking of the tunnel runs is being carried out from the Shengavit Station in the direction of Spandaryana Square. The tunnel excavation workers of Aleksandr Masuryan's brigade and their comrades, after their enforced idleness, are working with great enthusiasm and are striving to catch up with the schedule, and by the end of the year to extend each tunnel up to 350 meters.

The construction project has spread over a broad front in the area of Spandaryana Square. From Shaft No 10, located on Tel-man Street, to the square 290 linear meters of approach excavations have been dug, through which materials will be delivered and rock will be carried out. Work has begun on sinking the left-hand station tunnel and the gallery leading to the assembly room. Good work is being done by the combination brigades of the tunnel excavation workers of Onik Shakh-suvaryan and Martun Avetisyan. However, their work is being delayed by the Arm-tonnel'stroy UTPK [upravleniye proizvodstvenno-tekhnologicheskoy komplektatsii; Production Supply Administration] with stoppages in the delivery of concrete. The Shaft No 10 collective is preparing to sink counter tunnel runs in the direction of the Shengavit Station. By its own efforts the SMU-160 machine shop manufactured a KM-14 tubing-layer, which will be used in finishing the tunnels.

A good pace is being kept up in the construction of the inclined escalator shaft on Spandaryana Square. Out of the 36 meters of this shaft, 22 meters have been sunk, and they have been finished with cast-iron tubing. The brigade leader of the combination tunnel-excavation brigade, Sergey Sarkisyan, and the unit leaders Leva Andriasyan, Artik Mkrtchyan, Volodya Simonyan, and Arkaik Petrosyan resolved to complete the sinking of the inclined shaft by 10 September and the escalator-motor room--by the end of the year.

According to the results of the socialist competition, during the second quarter the section named "Inclined Shaft of the Spandaryana Station," led by Mikhail Pozhidayev, won first prize among the groups of the Armtonnel'stroy SU [Construction Administration].

Operations have been completed on sinking the approach excavation from the core of Shaft No 11 to the assembly room with a length of 110 meters, as well as the construction of the basic drainage system for draining ground waters with a discharge flow of 100 cubic meters per hour. At the present time the group of Shaft No 11 is carrying out operations on waterproofing the approach excavation and finishing up the installation of the mining complex.

With each passing day on the line of the first stage of the Yerevan Metro, the work front becomes broader, and the pace quickens. In order to maintain this pace at a high level, we must set up a nonstop material and technical supply system and provide manpower to all the cutting faces.

#### Oktemberyan Station Addition

Yerevan KOMMUNIST in Russian 9 Aug 83 p 1

[Article by A. Pozoyev, chief engineer of Armtonnel'stroy TO-25: "Throughout the Entire Front"]

[Text] Construction of the deeply placed Oktemberyan Station on the operating line of the Yerevan Metro without interrupting train traffic constitutes a complex engineering task. The complexity is a result of difficult geological conditions.

① This station is being built by the efforts of two sections of TO [Tunnel Detachment]-25. Two brigades, those of A. Arakelyan and Zh. Alekryan, are conducting operations on the central station tunnel. As of today, 36 cast-iron rings have been installed. The remaining 53 rings are intended to be assembled before the end of the year. In order to accomplish this, it is necessary to speed up the delivery of 676 cast-iron tubings from the Moscow Machinery Plant of Glavtonnel'metstroy.

N. Kopylov's brigade, working on the construction of the station's traction substation (STP), completed its own assigned task in July. This brigade pledged to extend the development of the STP by four more rings in order to install on the completed section a tubing-layer; the latter will be manufactured and mounted by the efforts of the TO-25 mechanical service in September.

Already in the finishing stages are the operations on working out the upper, internal passages (80 linear meters have been sunk, and only 6 remain). We are also confronted with the task of beginning in September the sinking of the lower exterior passages.

The groups of Sections No 1 and No 2 of Tunnel Detachment No 25 of Armtonnel'stroy are confronted with the task of overcoming great difficulties; they must skillfully and with a technical literacy organize the work of carrying out the targeted task--completing the construction of the Oktemberyan Station during the 11th Five-Year Plan with a high degree of quality.

#### Druzhba-Achapnyak Extension

Yerevan KOMMUNIST in Russian 9 Aug 83 p 1

[Article by E. Starostov: "The Route to Achapnyak"]

② [Text] The surface territory of Mine No. 24 is located "on a dime." On all sides the metro builders are surrounded by gardens and residential structures. And the construction site itself is filled with sections and parts of shaft equipment, rails for small cars, and building stone. And it is here that operations are being conducted on installing the mining complex.

The brigade of fitter-installers, led by the chief mechanic of the shaft, Ruben Mkrtchyan, these days is carrying out the installation of the shaft-hoisting machinery and the telfer trestle. At the same time construction workers are also working at the mine; they are putting up the walls of the machine room and finishing construction of the shower rooms and surveying and administrative offices.

Underground these days work is being carried out on sinking two approach galleries, temporary, reinforcement frames are being put in place, and concrete is being placed in the walls and the vault.

"We still have many problems and difficulties," states the acting chief of the section, G. Grigoryan. "The tunnel-excavation workers must descend to a depth equivalent to the height of an 18-storey building by metal staircases. As soon

① as the second approach gallery is sunk, the tunnel-excavation workers will be transferred to complete the installation of the mining complex and set up the mine cages."

The first approach gallery, 35 meters in length, has already been sunk, and it merely remains to be reinforced and concreted.

The following persons have labored outstandingly on the installation of the shaft-hoist and the sections of the mining complex: the welder Grisha Sarkisyan, the installation workers Aykaz Petrosyan and Vasya Mkrtchyan. High indicators have been achieved by the tunnel-excavation workers Suren Asmaryan and Sergey Arutyunyan, the brigade leader of the combination brigade, Aleksandr Nazaryan, the top cager, Margo Mailyan, and the section surveyor, Goar Tananyan.

Soon on the section of Shaft No 24 work will begin on sinking the tunnel runs in the direction of the Druzhba Station and the Achapnyak residential district.

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## RAIL SYSTEMS

### WORK SOON TO BEGIN ON MOSCOW METRO'S KALUZHSKIY RADIUS SOUTHERN EXTENSION

Moscow GUDOK in Russian 22 Sep 83 p 3.

[Article by D. Bashkirov: "A Metro Station in a Park"]

[Text] Among the lines of the capital's metro, the Kaluzhskiy-Rizhskiy line has undergone some significant changes in recent years. With the extension of a branch to "Medvedkovo", this radius has started to do a better job of meeting the city's needs. But at the same time, the southern part of the line still does not meet the increased need for transportation that has arisen in connection with the rapid growth of new construction projects in the new rayons of Kon'kovo, Derevlevo, Teplyy Stan, and Yasenevo.

Now we can say that these rayons will also become more accessible. A plan has been developed for trains to go beyond the "Belyayevo" station. The stations are already well known, since the Moscow soviet executive committee recently approved the names for the new stations. The terminal point will be the "Bittsevskiy Park" metro station. It will be built close to the intersection of Novoyasenevskiy Prospekt and Solovin'yinyy Proyezd. From there it is just a stone's throw to Bittsevskiy Park, where thousands of Muscovites go on Sundays.

Vladimir Aleksandrovich Shmerling, chief project engineer from the State Metro Transportation Design Institute, said, "Construction will begin at the end of 1983. Now, while we are working out the details of the plan, we are also compiling the working specifications for the builders. Speaking in concrete terms, the length of the line is about seven kilometers. The first station after "Belyayevo" will be "Kon'kovo"; it will be built at the intersection of Profsoyuznaya and Ostrovityanovo streets. The next station, "Teplyy Stan", will be built at the intersection of Profsoyuznaya Street and Novoyasenevskiy Prospekt. Then comes "Yasenevo" station, between Tarusskaya and Yasnogorskaya streets where they intersect with Novoyasenevskiy Prospekt."

The entire line will be built using the open construction method.

Recently the first construction workers from Construction and Installation Administrations Nos 1 and 2 of the Moscow Metro Construction Administration arrived at the site where the "Kon'kovo" station will be erected. They are now

doing the preparatory work, which is not one of the easiest stages. They still have to lay down the communication lines. At Teplyy Stan work is being done on laying down the electric cables that will supply the construction site with electrical power. In several months the excavation work will begin on the "Belyayevo"--"Kon'kovo" section.

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## RAIL SYSTEMS

### NEW CONSTRUCTION METHODS USED FOR MOSCOW METRO'S GOR'KOVSKAYA STATION

Moscow STROITEL'NAYA GAZETA in Russian 23 Sep 83 p 3

[Article by V. Khrapov, doctor of technical sciences, professor at the Moscow Railroad Transportation Engineering Institute: "A New Step in Metro Construction"]

[Text] In the very center of Moscow, in the area of Pushkin Square, a large new transfer junction between three metro stations is being built. Two of these stations--"Pushkinskaya" on the Zhdanovskiy-Krasnopresnenskiy line and "Gor'kovskaya" on the Gor'kovskiy-Zamoskvoretskiy line--are already in operation. After construction is completed on the central section of the Timeryazevskiy-Serpukhovskiy line, the third station, "Chekhovskaya", will be put into operation.

The construction of the "Gor'kovskaya" station is a major achievement in subway construction.

It had to be built between the "Ploshchad' Sverdlova" and "Mayakovskaya" stations under complicated engineering and geological conditions. The excavation work was done in direct proximity to existing tunnels; during the rush hours 45 7-car trains pass through the tunnels at high speeds.

All this led to a radical change in the design of the side tunnels. The vaults encircling the shunt tunnels were set up on special band-like supports made of large blocks of reinforced concrete arranged at different levels.

Traditional methods for building a metro station could not be used here. There were no precedents for doing work of this kind, so a fundamentally new solution had to be found. The task would have been simpler, of course, if it had been possible to curtail the train traffic on the lines involved. This was not a suitable option. It was not possible to use the classical methods for excavation work that involve the use of wood timbers.

The essence of the new method lies in the over-all coordination of the design peculiarities of the station with progressive, industrially-based construction methods. Special arched tubing plates have been designed for the construction of the branch station tunnels; they will be used on the rail track with the band supports of the side vaults.

The rock excavation has been done with a hydraulic wedge and air hammers. Where there was intermittent stratification of rock with varying structure and strength, varying water penetration of the rock face, and weak clay in the roofing of the tunnels, a strict, consistent, and uninterrupted system for the construction operations was developed and adhered to. The rock excavation zone and the area where finishing installation work was being done were separated from the shunt tunnels by protective planking.

It should be mentioned that there were many strong points in the planning solutions as well.

The "Gor'kovskaya" and "Pushkinskaya" stations, and the future "Chekhovskaya" station are arranged in the plan according to a functionally convenient triangular model. It is important that in the central part of each station relatively short passageways have been planned for passengers making transfers.

The entrance to the "Gor'kovskaya" and "Pushkinskaya" stations is an underground vestibule that has connections to the editorial building of the newspaper IZVESTIYA; the pedestrian underpass that goes under Gorky Street; and the square that is in front of the A. S. Pushkin monument.

The progressive new method for building "Gor'kovskaya" station will be of great significance in the further development of the network of the subway and its transfer points.

The collective of designers and builders that solved the complex problems involved in building this station won the Prize of the USSR Council of Ministers.

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## RAIL SYSTEMS

### CONSTRUCTION TECHNIQUES DEVELOPED FOR LENINGRAD METRO

Leningrad LENINGRADSKAYA PRAVDA in Russian 23 Sep 83 p 4

[Interview with N. I. Kulagin, director of the Leningrad State Metro Transportation Design Institute, by LENINGRADSKAYA PRAVDA correspondent N. Kireyev; time and place not given]

[Text] [Question] Like many other new residents living in the area of the former Komendant Airport, I like the new "Pionerskaya" metro station. It is well designed and it is very convenient for passengers. There is nothing that interferes with moving around the platform areas. Tell me, please, when did these single-vaulted stations appear in the Leningrad metro and will more of them be built in the future?

[Answer] I should point out first of all that many technical innovations were generated during the construction of the Leningrad metro. It was here that highly productive sluice excavation units, mechanized technological complexes, and improved and economical types of tunnel designs were developed and put into production. A fundamentally new process for tunnel construction was developed that made it possible to increase significantly the speed at which the tunnels can be excavated, to make maximum reductions in the manual labor input, and to eliminate many difficult production processes. An example of the successful creative efforts of Leningrad specialists is the creation of our country's first deep foundation single-vault stations. In 1975 the "Ploshchad' Muzhestva" and "Politekhnicheskaya" stations, both of which follow this design, were put into operation. They are spacious and convenient and passengers liked them immediately.

The metro builders also had the opportunity to mechanize as much as possible the labor intensive excavation work. It is enough to say that even powerful excavators are used in the underground construction of single-vault stations. A new mechanized unit is now being readied for use in working the rock and installing the upper vault of stations of this type; the designers of the Leningrad State Metro Transportation Design Institute also participated in the design of this equipment.

The single-vault stations also have economic benefits. Their construction saves hundreds of tons of metal that is in short supply. Considerable reductions have been achieved in the settling of buildings above the stations, which is of course very important.

Because of these advantages, the new stations have been given a green light. Last year three single-vault stations started receiving passengers all at once: the "Chernaya rechka", "Pionerskaya", and "Udel'naya" stations. There will be three more stations of this type on the Pravoberezhnyy line that is now under construction. The first of these stations will be at the intersection of Krasnogvardeyskiy and Zanevskiy Prospekts; the second will be in the area of the former Dacha Dolgorukov, where the new Ladozhskiy station will be built later; the third will be close to the intersection of Bol'shevik Prospekt and Kollontay Street.

There are plans to build single-vault metro stations also on future underground lines in Leningrad. Of course, our architects take care that each of them has an original design.

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## MARITIME AND RIVER FLEETS

### RIVER FLEET MINISTRY COLLEGIUM REVIEWS CURRENT PROBLEMS

Moscow VODNYI TRANSPORT in Russian 13 Aug 83 p 1

[Unattributed article: "In the Collegium of the Ministry of the River Fleet"]

[Text] A regular meeting of the collegium has discussed the question of the results of fulfilling transport tasks for July and of the measures for ensuring the plan for August of the current year. In the discussion of this question, the basic indicators of the collectives of the Volga Associated, Yenisey and Northern Steamship Lines revealed the reasons for the failure to fulfill July's task. The resolution passed by the collegium noted a number of specific measures directed toward the complete fulfillment of the August passenger and freight transport task.

The question of the work of the Volga Associated Steamship Line in switching freight to river transport was also discussed. In the past 2 years, the Volga Steamship Line has transferred only 1.2 million tons of freight to the river from the railway. This is considerably less than the tasks set by the directive organs. During the navigation period, more than 2 million tons of timber have been transported parallel to water routes southward from the European North. However, the steamship line has done little to switch this flow of freight from the railway to river transport.

The collegium discussed the question of the work of the Main Administration for Workers' Supply of the Ministry of the River Fleet on improving the provisioning of river transport workers and passengers and on developing the material technical bases of commerce and public catering. The collegium noted that the Main Administration for Workers' Supply of the Ministry of the River Fleet and the organizations in its charge had done work to improve the provisioning of river transport workers and passengers. In the past 2 1/2 years, 204 trade and public catering enterprises and 21 agricultural projects have been put into operation.

In its resolution, the collegium proposed that the leadership of the Main Administration for Workers' Supply, the Ministry of the River Fleet, and the chiefs of the administrations for workers' supply of the steamship lines take steps to eliminate the lag in fulfilling the commodity turnover and profit plans and to complete the preparation of vegetable storage facilities and refrigerators to hold the vegetables, potatoes and fruits of the new harvest. It was suggested that in August the chiefs of the steamship lines review the course of the construction of commercial, public catering and agricultural projects at their regular conferences.

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## MARITIME AND RIVER FLEETS

### SCHOOL'S ROLE IN TRAINING SPECIALISTS FOR NUCLEAR-POWERED VESSELS

Moscow VODNYI TRANSPORT in Russian 11 Aug 83 p 3

[Article by V. Kuznetsov, chief of the ships' nuclear power plant department of the Leningrad Higher Engineering Naval School, candidate of technical sciences, Leningrad: "Who Is to Operate Ships' Nuclear Power Plant?"]

[Text] Who is to operate ships' nuclear power plants, physicists or sailors? Which guarantees success and opens prospects for the technologically competent and safe use of nuclear-powered vessels: the study of the ship and its complex systems and machinery by physicists, or additional study by sailors of the foundations and rules for the use of an essentially new source of energy for the fleet? These questions arose more than 25 years ago during the planning and construction of the first-born of the nuclear navy--the icebreaker "Lenin."

Where to get specialists for the new ships? The Leningrad Higher Engineering Naval School imeni Admiral S. O. Makarov was instructed to organize their training for the first nuclear-powered vessel.

Scientists and designers from the scientific and planning institutes and the design bureaus that planned and built the icebreaker "Lenin" took part in drafting the programs and then in training the specialists. Special attention was given to the training of the group of engineer operators. Young engineering officers who had just completed the ships' machinery course at the Leningrad Higher Engineering Naval School made up its nucleus.

Up to the moment of the start of the running trials, a state commission under the chairmanship of A. Aleksandrov, the project's scientific director, now an academician and the president of the USSR Academy of Sciences, made tests and allowed the crew's engineering personnel to operate the icebreaker's nuclear power plants.

Many years of experience in operating nuclear-powered vessels have demonstrated not only the technological expediency of employing nuclear power plants aboard ships and their high reliability in the most complex working conditions in the

Arctic ice, but also their complete radiation safety. A better confirmation of this is that 35 members of the first crew are still sailing aboard nuclear icebreakers.

The construction of new nuclear icebreakers and the transition to year-round navigation in the Arctic's western sector have raised the question of the need for double crews and of the establishment of a constantly operational system for the training and retraining of cadres for nuclear icebreakers.

More than 10 years ago, the department for improvement of professional skills of Leningrad Higher Engineering Naval School began to carry out the first training of specialists for the navigation, nuclear engineering, electrical engineering and other services. They take 2-month retraining courses every 5 years.

At the present time, the department's graduating students acquire practical skills right on board icebreakers. The various specialists need from 6 months to 1 1/2 years of probation aboard an icebreaker to take their examinations and be admitted to independent watch keeping.

Such a multi-stage system of training--VUZ, improvement of professional skills, probation aboard icebreakers--is very lengthy and expensive. All the same, it is justified not only from the technological but also from the economic points of view, for mistakes and incorrect actions by the personnel could lead to considerable economic losses estimated at tens of millions of rubles.

The experience of the USSR in the training of cadres for ships with nuclear power plants has found reflection in the "Code of Safety for Nuclear Merchant Ships" approved by the International Maritime Organization [IMO] in 1981. It defined the general principles and even the content of training programs for specialists, their certification, and the granting of diplomas.

In our country, a program for the construction of nuclear-powered vessels has been worked out for the coming decades. We have already begun construction of icebreakers of the "Rossiya" type and of an Arctic-class lighter and container carrier. In cooperation with Finland, work is in progress on the planning and construction of shallow-draught icebreakers. The creation of powerful icebreaker-leaders and general-purpose transport ships for the Arctic is in prospect. The realization of this program requires the training of the hundreds of engineers necessary for the operation of a nuclear fleet. In order to resolve this task, it is necessary to establish a more perfect and modern system for training cadres.

In 1980, the Leningrad Higher Engineering Naval School's ships' engineering and electrical engineering departments introduced the specializations "Operation of Ships' Nuclear Power Plants" and "Operation of Electrical Equipment and Automatic Direction and Control Systems of Ships' Nuclear Power Plants". The first enrollments in these groups also took place in that year.

The ships' nuclear power plant department will carry out the training of students in the nuclear specialization groups together with the school's other departments. It has set up a laboratory furnished with training equipment.

In order to increase the quality of practical training and to shorten its duration, it has been decided to establish an educational training center for nuclear power plants at the Leningrad Higher Engineering Naval School. Fitting it out with training equipment and the necessary laboratories is envisaged. Here sailors will receive training and retraining in five specialities annually.

Much has been done, and we are going to do still more. There has been no final decision on the allotment to the Murmansk Maritime Steamship Line, which is a general client, of additional funds for the acquisition of equipment and the reconstruction of the building in which to house it. The question of the source and volume of financing to maintain the center has not been decided. The center's official staff pay schedule, which should as far as possible approximate the corresponding pay rates on nuclear icebreakers, is subject to review and confirmation. By the way, in our view this is the only way of solving the problem of staffing the center with educational personnel who know the ins and outs of operating ships' nuclear power plants in detail.

The training of new specialists for the fleet is impossible without complex and expensive training technology. All expenses will in due course be repaid a hundredfold.

At the present time, graduates of our school make up more than 97 percent of the navigation personnel and the nuclear engineering and electrical engineering services of nuclear-powered vessels. Our collective rightly takes pride in this, and will do everything it can to successfully complete the establishment of the new system of training cadres for ships with nuclear power plants and to provide the nuclear fleet with highly qualified specialists.

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## MARITIME AND RIVER FLEETS

### WHITE SEA-BALTIC CANAL UNDERGOING RECONSTRUCTION

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 2 Aug 83 p 1

[Article by N. Yuoperi and I. Kokov, Karelian ASSR: "The Blue Highway: 50 Years for the White Sea-Baltic Canal"]

[Text] On 2 August 1933, the Soviet of People's Commissars of the USSR adopted a decree concerning the canal's inclusion among the country's operational domestic arteries.

A half century ago, the name of this first Soviet canal resounded throughout the entire world. In rapid order, the geographical correction of the century had appeared on the map. Such was this event christened abroad. Of course, for the canal linked the White Sea with the Baltic and, through the Mariinskiy system, with the Volga and the Caspian! And in addition, the water route from Leningrad to Arkhangelsk was shortened by 4,000 kilometers in comparison with the sea route....

"Yes, I don't recognize the canal today," says K. Grin, captain of the tugboat "Anna Lisitsina", looking at the panorama of Lock No 1. "Before, to speed up the ship's passage through its chamber, our crew went ashore and helped the women turn the winch. Now we pass through the stretch from Povenets to Belomorsk four times faster!"

Our journey through the canal's 19 locks was approaching its end. Making use of the brief halt of the motor vessel "Volgo-Balt-10" in the lock's chamber, we ask its captian, V. Zhukov, to come to the ship's rail and say a few words about his crew, to share his thoughts about the canal and the work of its personnel.

"We're taking a cargo of coal from Cherepovets to Kandalaksha. I won't hide it: the crew is always in a good mood when we are sent on a voyage along the White Sea-Baltic Canal. The navigational situation is excellent along its entire length. Along the way, we are provided with exact and up-to-date information about all changes in the canal. The passage of ships through the locks is faultlessly organized. We thank the operators for their excellent service and want them to keep it so!"

Our last meeting at the northern slopes of the White Sea-Baltic Canal was with G. Zalazyev, the chief of waterway construction for Sosnovetskiy Rayon, whose collective services this portion of the waterway. He said:

"In the 11th Five-Year Plan, the country's river transport workers have taken upon themselves a considerable portion of the freight of railway transport. This in turn was not slow in having its effect on the work of the canal. The intensity of the ships' movement has considerably increased since the start of the current navigational season. Thus, in the first 2 months of work, 2,000 more ships passed through the locks of the northern slope than in the same time period last year."

A man-made water highway 227 kilometers long is now being intensively renovated. More than a third of the wooden lock structures have already been replaced with concrete ones. Mechanization and automation have been introduced in all 19 locks, which has allowed the canal's carrying capacity to be almost doubled. In addition, the number of service personnel has been cut to one-fifth as many as in the prewar period. For its great contribution to the development of the economy of the country's European North, the White Sea-Baltic Canal has been awarded the Order of Labor Red Banner in connection with its 50th anniversary.

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## PORTS AND TRANSSHIPMENT CENTERS

### KINESHMA PORT DEPUTY CHIEF ON NEED FOR EXPANDED FACILITIES

Moscow RECHNOY TRANSPORT in Russian No 8, Aug 83 p 15

[Article by V. Smirnov, deputy chief of Kineshma port: "The Development of Customers' Moorages"]

[Text] The Kineshma port provides transport services for dozens of riverside regions in Ivanovo and Kostroma oblasts and it processes vessels in the Gorkiy reservoir from Ples to Puchezh and along the river Unzh all the way up to Kologriv in the spring. Over 200,000 tons of dolomite powder arrive by rail and are shipped by the local fleet; gravel and sand for construction and road building organizations are unloaded from transit vessels. The volume of transport operations is growing every year. At the height of the shipping season there is a shortage of railcars and motor vehicles for shipping the freight out, so the moorages and warehouses are filled completely. As a result, vessels that are waiting to be unloaded have to stand idle for long periods. In our opinion, it does not make sense to build costly moorages with vertical seawalls for transferring mineral construction materials. This problem should be resolved by setting up moorages on naturally non-eroding river banks that have large freight areas and deep enough water.

At the moorages of the Ivanovo Keramzit Reinforced Concrete Structures Plant and the Kineshma Specialized Road Construction Section, vessels of the "Volga-Don" type can be unloaded; and at the moorages of Road Construction Administration No 2 and the Road Repair and Construction Administration, vessels carrying sand and gravel can be unloaded.

There are some moorages where the water is too shallow for the large-capacity transit vessels; they need to be deepened. This work has been done at the moorages of the Yuryevets Road Repair and Construction Administration, the Rayon Agricultural Chemical Plant, along the Yelnat River, and in Sokolskiy and Kineshma. The dredging work is being done by the Kineshma Road Engineering Section. In 1982 at the port's initiative a 200-meter long moorage with an approach depth of 4 meters was organized in Yeltinka for the Kineshma Road Repair and Construction Administration for unloading mineral construction materials.

The crew using the "Volga-34" dredging machine has removed 103,000 cubic meters of earth from the approach to the Yeltinka moorage. This moorage is very convenient, it has a large freight area, it is located 5 km from the asphalt

and concrete plant, and it has access to the Yuryevets-Kineshma highway and the adjacent road.

The conditions along the river bank make it possible to organize moorages here for other enterprises as well. The Volga Basin Road Administration can create two more moorages (250 meters); this will make it possible to have uninterrupted delivery of freight from vessels for the Kineshma rayon and other rayons of Ivanovo Oblast.

There are 36 moorage-warehouses organized at points in the Gorkiy reservoir within the limits of the Kineshma port along the natural river banks; these are customers' moorages for unloading mineral construction materials. Vessels are unloaded by floating cranes, but because of insufficient depth not all the moorages can be used for unloading vessels of the "Volga-Don" type and other large-capacity vessels. There are 32 moorages for unloading vessels carrying dolomite powder. The length of each moorage is 50-80 meters, the capacity of the warehouses is 5,000-15,000 tons, and the depth of the moorages makes it possible to handle vessels with carrying capacities of 2000 tons. When freight is transferred to the rear of the moorages, the capacity of the warehouses can be increased several-fold. This will contribute to a significant increase in the volume of transshipment operations.

Use of natural banks as base moorage-warehouses for mineral construction materials will help increase the efficiency of the port's operation; it will help expand the zone of services for the customers; and it will help increase the transfer of freight and will accelerate the rate at which vessels are processed. Between 1975 and 1982 freight handling at the port increased by 29.5 percent; the transfer of mineral construction materials increased by 16 percent and the transfer of dolomite powder increased by 79.6 percent.

The simplicity of organizing moorages of this type, and the low cost and reliability of their operation meet the all the demands of the freight consignees. Organization of these moorages is necessary in light of the development during the 11th Five-Year Plan of local gravel and sand deposits in the Trans-Volga region and the underwater removal of coarse sand in the Volga near the Semigorye docks; these resources will provide mineral construction materials for projects in the Nonchernozem region.

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## PORTS AND TRANSSHIPMENT CENTERS

### ILICHEVSK PORT WORKERS SUPPORT MOSCOW CAR REPAIR INITIATIVE

Moscow MORSKOY FLOT in Russian No 8, Aug 83 pp 12-13

[Article by G. Zikeyev, deputy chief of the Ilichevsk port for railroad shipping: "Supporting the Muscovites' Initiative"]

✓ [Text] Ilichevsk Transport Center--Here strong ties between port workers and railroad workers form the foundation for an efficient unified transport process. Almost 90 percent of the freight that passes through the port is delivered by rail or shipped out by rail. More than 1000 railcars carrying various national economic and foreign trade freight are processed here daily.

Cooperation between the workers in these related sectors is growing deeper every day. Joint plans for the economic and social development of the transport center are being worked out; and forms of cooperation are being improved that will make it possible to overcome bureaucratic barriers.

Nonetheless, bureaucratic barriers can still be felt at points where different forms of transport intersect. Freight is not always shipped out of the port promptly; there is a shortage of railcars; and vessels stand idle. Often the port's daily demand for railcars is met by only 70-75 percent.

✓ The socialist competition that has been spread extensively among the port workers and railroad workers for railcars' increased freight carrying capacity has helped to solve the problem of a railcar shortage by using rational loading methods. In 1982 the Ilichevsk transport workers freed up more than 3000 railcars by using more efficient loading methods; this made it possible to ship 100,000 tons of national economic freight above the planned level.

In the first quarter of 1983 the average load per railcar was 3.5 tons above the planned level.

✓ By searching out reserves for increasing labor productivity, the port workers were able to reduce significantly the amount of time required for loading the railcars. This allowed them to free up more than 1000 railcars. Steps are being taken to improve the technology of loading operations at the port itself and at the Ilichevsk and Ilichevsk-Paromnyy railroad stations that are adjacent to the port.

The transport center's Council is playing an important role in resolving many problems that arise in the joint operations. At the Council's meetings directors of the associated enterprises search for new ways to eliminate shortcomings.

For a long period of time one of these shortcomings was supplying the port with railcars that were suitable in terms of their technical and commercial condition for carrying freight. This required extra shunting operations in order to remove the damaged cars and a nonproductive empty run from the station to the railcar repair points. For example, in 1981 out of all the railcars delivered for shipping about 1000 railcars were rejected. In 1982 over 2000 cars were rejected. A large number of the cars were rejected because of defects that were quite minor.

The question of the unsatisfactory condition of railcars has been discussed a number of times at meetings of the Council, and mutual complaints were registered. Unfortunately, damage does occur to the railcars in the port during loading and unloading operations. There are various reasons for this. Some railcars are damaged due to imperfect loading and unloading processes; other damage is caused by factors not dependent on the port workers. The delivery of frozen cargo in railcars causes major problems; as a rule, unloading of this freight is accompanied by damage to the cars.

A shortage of railcars has remained a constant element of our work. In certain instances it has been necessary to repair cars. In 1981 a little over 200 cars were repaired; in 1982 about 300 cars were repaired. These repairs were done unsystematically, sometimes by workers who were lacking the necessary skills.

The initiative of Moscow enterprises, who have taken on the task of repairing railcars and containers using their own resources on a higher technical basis, has been approved by the CPSU Central Committee and the USSR Council of Ministers; it has received broad support in our collective as well.

Members of the port collective discussed the initiative of the Moscow enterprises and, recognizing the importance of the problem and weighing their own technical possibilities, signed an agreement with the collective of the Odessa Railroad to repair railcars and containers.

Since there is an acute shortage of platforms for large-capacity containers, a specialized section was created based on the port's repair shops that, in addition to repairing containers, as of January 1983 started to repair these platforms using methods that have been coordinated with the railroad workers.

This section has been provided with a portal crane and electric welding equipment; the brigade of repair workers includes gas and electric welders and highly skilled metal workers.

In the first quarter of 1983 the shop repaired 123 platforms (the plan called for 105) and 64 containers (the plan called for 25).

A great deal of work is being done at the port to repair other types of rolling stock: boxcars and coal cars. They are being repaired right at the loading

sections under the guidance of specialists who have passed a special training course. In the first quarter of 1983, 70 railcars were repaired in these sections.

Having put more than 250 railcars back into operation, the port workers have taken on the responsibility of shipping an additional 25,000 tons of freight by renovating railcars and containers.

Working side by side with the port workers are the railroad workers from the Ilichevsk station; they are also making a large contribution to railcar repair.

The search for new forms of cooperation among the workers in related sectors of the transport center is having positive results; maritime transport and railroad transport, and thus, the entire national economy, are benefiting from this cooperation.

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## PORTS AND TRANSSHIPMENT CENTERS

### CREWS WARNED OF POOR QUALITY FUEL BUNKERED AT FOREIGN PORTS

Moscow MORSKOY FLOT in Russian No 8, Aug 83 p 41

[Article by V. Vasilevich: "Bunkering in Foreign Ports: To Help the Ship's Engineer"]

[Text] In recent years many steamships have been carrying out barter-purchase operations with bunker fuel through the good officer of the Soviet-West German firm Bominflot. The number of bunkerings of Soviet ships in foreign ports has increased because of this. Such a practice permits better employment of the ships' carrying capacity and avoids loss of time due to special calls at Soviet ports for bunkering. In this respect, the probability of receiving poor-quality fuel has appeared. One can often meet with news of such instances in the foreign maritime press. The existing system of organizing the supply of fuel to Soviet ships abroad is limited by the regulation of prices, but does not guarantee the qualitative characteristics of the bunker fuel in all possible ports of call. It is important for ship's personnel, especially the ship's engineers, to have some idea of the reasons for the change for the worse of fuel at foreign bases and to check its quality when it is received.

In the past decade, a sharp increase has occurred in the price of crude oil, and relations have changed between the oil-supplying countries and the oil monopolies. These factors have to some degree influenced the quality of fuel for ships. The oil monopolies are trying to compensate for the increase in outlays for oil by means of processing it more thoroughly in the oil refineries and distilling out as much as possible of the light and more valuable oil products. As a result, the heavy grades of oil have begun to contain more of the residual products of refining. Difficulties have arisen with the supplying of the highest quality grades of crude oil, and the output of oil with undesirable admixtures has increased. And finally, new oil companies have appeared which are trying to conquer the bunker fuel market by lowering their prices for it, but they are doing this basically at the expense of quality.

In the last five years, almost all major oil refineries in the capitalist countries have put into operation catalytic cracking plants or are in the process of doing so. As a result, the viscosity of residual fuel oil has increased to 500 sSt, and fuel oil with a viscosity of up to

420 sSt is being offered on the market for the bunkering of ships. The relative mass of this remnant reaches one. The content of the admixtures of metals, coke, and sulphur is being increased. The oil monopolies have the opportunity in their refineries to produce fuel oils of better quality if the fuel is ordered in good time. However, "independent" companies satisfy approximately half of the requirements of the world's fleet for bunker fuel. They lack an adequate material technological base for producing fuel oils, and often provide fake results of analyses when selling fuel. There have been reports that almost all the "independent" companies in the port of Rotterdam, in obtaining residual fuel oil from the refineries, mix it with distillate right on the bunkering barge without any mixing plant. As a rule, there is no checking of the components of fuels for consistency.

In such situations, one can make claims against the supplier, but more often (this is possible in all the world's ports) the bunker fuel supplier has acquired the heavy batch of fuel oil already mixed, and in this case the usual analysis does not help. Problems come up aboard ship after its departure for its voyage. Bominflot has already encountered lack of good faith on the part of bunkering firms that supply fuel that does not conform to contract specifications.

Unfortunately, there are no prescriptions that completely exclude the possibility of obtaining low-quality fuel abroad. There is considerably less probability of obtaining bad bunker fuel at the Bominflot bases in the FRG, Holland, Singapore and Japan, and also in Ceuta, where the fuel supplied is basically obtained from Soviet ports, and where in the event of purchases of heavy batches on the international market a complete laboratory analysis of it is conducted. It is hardly possible to require analyses and detailed quality certificates from all fuel suppliers, for added expenses are connected with this.

Foreign shipowners, insofar as they too are confronted with this problem, usually adopt a fuel treatment system and make use of the corresponding lubricating oil that compensates for the lower quality of the fuel. This problem is also considered in ordering new ships. Use of heavy, low-quality fuel aboard their ships is so profitable for foreign shipowners that in individual cases they opt for early replacement of the ship's engine (because of its increased wear).

For the crews of Soviet ships that regularly obtain bunker fuel in domestic ports, problems with its quality have never been acute. It is especially necessary for them to pay more attention when obtaining fuel in foreign ports, to avoid bunkering at little-known bases of foreign firms, and to apply the methods of checking possible in shipboard conditions.

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